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Keeping Costs Down on the G. E. "Liftop"

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Production and planning departments play important parts in producing an electric refrigerator for the quantity market

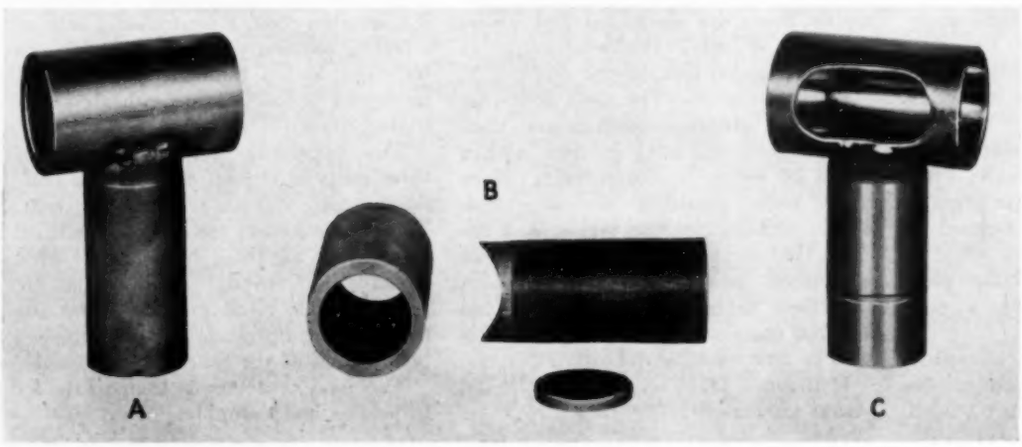
DEVELOPED in answer to an ever-growing demand for a high quality machine that could be sold at low cost, the "Liftop" refrigerator raised a number of problems which had to be met by the General Electric Company's engineering and factory organizations. In order to confine the total cost of this unit within definite limits it was necessary to hold material and labor costs down and also to keep development costs as low as practicable. This last factor was given special attention.

There were several conditions which existed when the "Liftop" was developed of which full advantage was taken in order to accomplish the desired results. These were: First, in the development of the G.E. "Monitor Top" refrigerators, it has always been the aim of the manufacturing division to develop parts of such a design that they can be used on several types of machines and to standardize these parts to as great a degree as possible. Second, in purchasing machine tools, those of standard design easily adapted to other jobs, have received preference. Third, when it was economical to do so, all types of refrigerators were processed on the same equipment. Fourth, because of obsolescence design, concentration of manufacturing facilities and improvements in methods, certain manufacturing equipment and floor space was idle; and fifth, a manufacturing organization was already set up and functioning which had only to be expanded to handle the new unit.

In developing the final design for the "Liftop," all of these conditions were constantly kept in mind. In all cases where it was possible to use standard parts efficiently, this was done; in those cases where a new design was required, every effort was made to adapt the new job to the existing idle equipment. By taking advantage of its eight years experience in the manufacture of electric refrigerators and by following the abovementioned procedure the manufacturing division was able to attain its objective.

In the following paragraphs the main component parts of the "Liftop" are listed and the manufacture of the more interesting parts are discussed in considerable detail.

Compressor—The compressor used in the "Liftop" is entirely standard in every way, having been developed for use on the "Monitor-Top" models. The compressors used on all General Electric hermetically sealed refrigerators



At *A* is shown the piston assembly consisting of the piston body, the piston head and the crosshead; at *B* are the parts before tack welding and hydrogen brazing; at *C* is the finished unit showing the slot cut in the bottom of the crosshead for the crankshaft

from 2 to 17 cu. ft. capacity are identical with the exception that a shaft of longer stroke and a different motor winding are used in all models of more than 7-cu.ft. capacity and that during assembly of these machines the cylinder is mounted slightly farther back in order to allow clearance for the longer-stroke shaft. Since it is impossible to attempt to describe the manufacture of the entire compressor in this article, a representative part has been chosen and will be described.

Piston Operations

The piston used in this compressor is of unique design and embodies practically every type of machine operation required on any of the other parts. The piston consists of three parts, the piston body (hollow), the piston head, and the crosshead. During assembly, the head is riveted into the piston body and the crosshead is tack-welded into place, and then the whole assembly is copper-hydrogen brazed in order to produce a light-weight leak-free assembly of great strength. The piston body is ground to its final diameter of 1.2498 in., plus 0.0000, minus 0.0003, in four cuts on Cincinnati centerless grinders. The slot in the side of the crosshead is cut on a Taylor-Fenn spline milling machine. The most difficult operation on this piston is the boring of the crosshead. Because of the extreme accuracy required, the final boring operation must be performed after the slot is cut in the side; after much experimentation, a peculiarly shaped tungsten-carbide tool was developed, and it now seems certain that it will be possible to bore these crossheads to the finish diameter of 1.2502 in, plus 0.0003 minus 0.0000, and dispense with the honing operation which originally was necessary. This boring operation is performed on a No. 38 two-spindle Heald Borematic and on an Ex-Cell-O diamond-boring machine.

Evaporator—The past experience of the manufacturing division in the fabrication of stainless steel evaporators made possible the development of a two-piece, line-welded, stainless steel evaporator of high efficiency and low cost. For the majority of the operations on this evaporator, it was possible to use available equipment.

The evaporator inner sheets are formed on a 1500-ton Hydraulic Press Manufacturing Company power press in one operation and are then trimmed on a 93C Toledo press; an outer sheet is blanked and pierced on this latter press at the same time that the inner sheet is trimmed.

Then, after cleaning and annealing, the evaporator sheets are clamped together in a fixture and spot-welded, where necessary to facilitate line welding, and also spot-welded at those places which cannot be reached by the line welders. The spot welding is done on a No. 112 Gibb spot welder. The sheets are then intermittent line-welded between corrugations. This intermittent line-welding is accomplished by setting the General Electric Thyratron control on the No. 100 National line-welding machines so as to produce a series of spot welds. These machines run at the rate of about 150 in. per minute and weld about three spots per inch, each spot being about ¼ in. long. As the welding around the outer edge and around the outlets must be absolutely leak-proof, the welding there is done at the rate of about 80 in. per min. and the Thyratron control set so that a continuous weld is produced.

The bead is then turned over in three operations on a No. 6A Bliss press. Six studs are projection-welded into place on a National spot welder, and the evaporator is folded into its final shape. The copper tubes are assembled and silver-soldered. Finally, the evaporator is tested for leaks, pickled and dried.

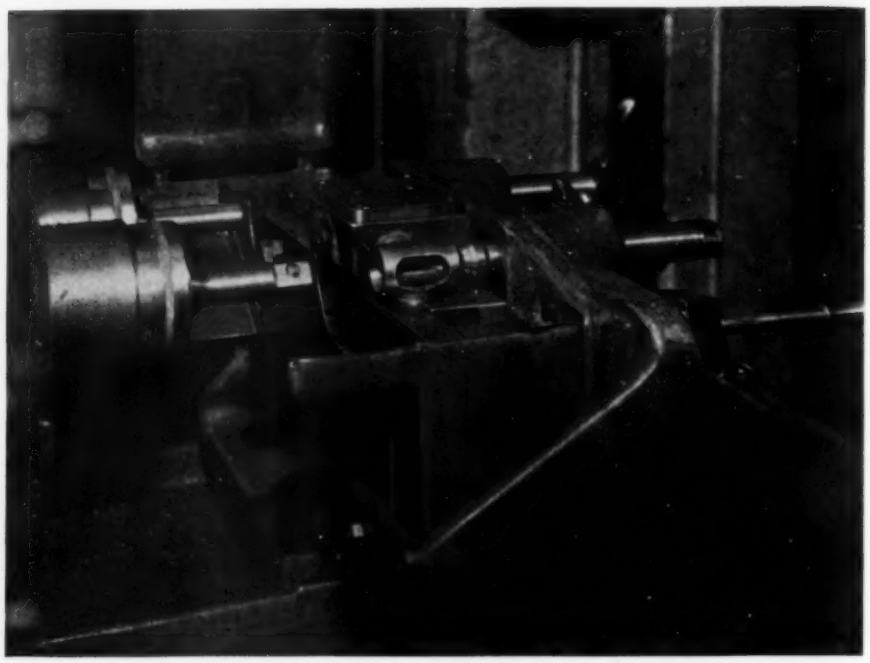
Food Container—The food container used is a vitreous-enameled steel shell 16 in. square and 13¼ in. deep with a radius of ½ in. in the corners. Since there were available several punch presses suitable for the job, it was decided that it would be better and more economical to develop a deep-drawn part than to bear the high labor and material costs of a fabricated shell. This shell is now made as follows:

1. Blank (37½-in. dia.)—(Round blanks purchased).
2. Draw cup (approximately 24 in. dia. x 9 in. deep)—No. 178 Toledo press.
3. First redraw (approximately 19-in. squarex12-in. deep)—No. 13A Bliss press.
4. Anneal (930 C. for 4 min.)—Continuous furnace.
5. Second redraw (approximately to finish size)—No. 13A Bliss press.
6. Anneal (930 C. for 4 min.)—Continuous furnace.
7. Draw to final size and shape—No. 13A Bliss press.
8. Trim—No. 41 Bliss press.
9. Form bead—No. 41 Bliss press.
10. Pierce holes in back side—No. 16 Niagara press.
11. Pierce holes in sides—No. 16 Bliss.

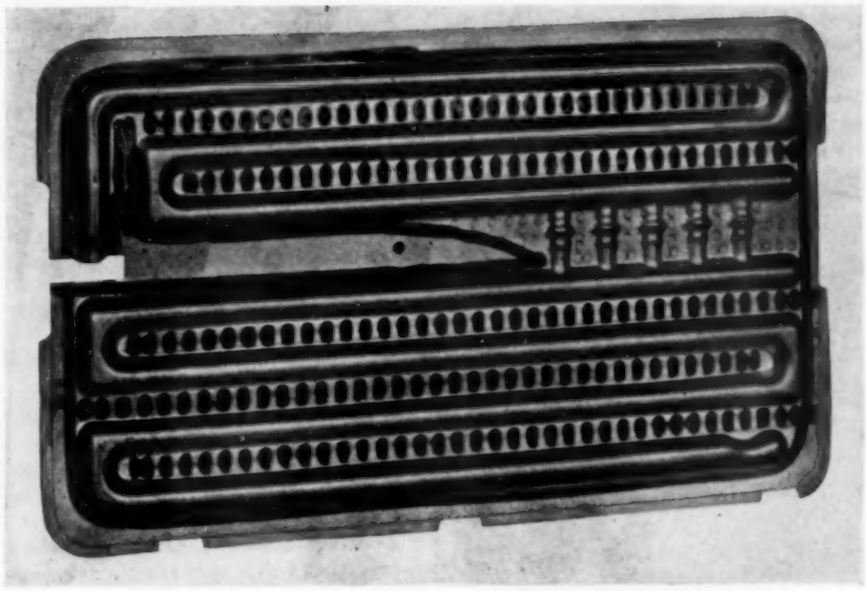
The shells are then delivered to the enameling department for pickling and enameling. The pickling treatment follows standard pickling procedure and consists of fifteen minutes in a boiling solution of a standard metal cleaner, two rinses, fifteen minutes in a six per cent sulphuric acid solution (140 to 160 F.), another rinse, a neutralizing bath in a boiling solution of soda ash and borax for eight to ten minutes, and then an air-drying period in a steam-heated ventilated dryer.

The enameling process consists of three coats of enamel, a ground, a half-finish white, and an acid resisting coat. The first two coats are dipped; the third is sprayed, all three being dryed in a steam-heated oven. The beads are sprayed with black enamel before the first burning operation and are brushed before each of the other two burnings.

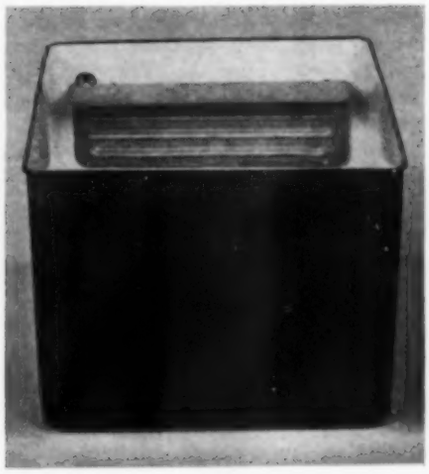
The food container is then ready for inspection and assembly.



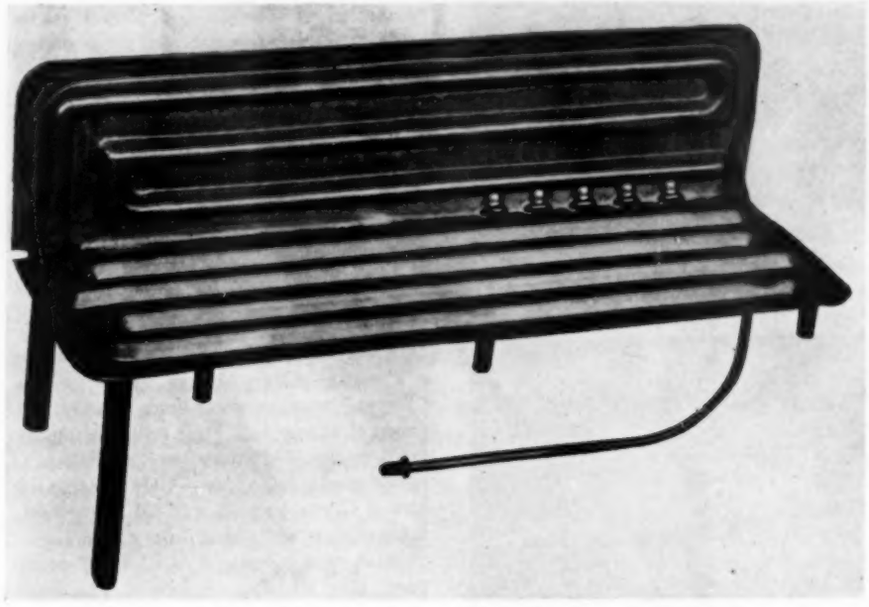
An odd-shaped cemented carbide boring tool is used for the final operation on the slotted crosshead



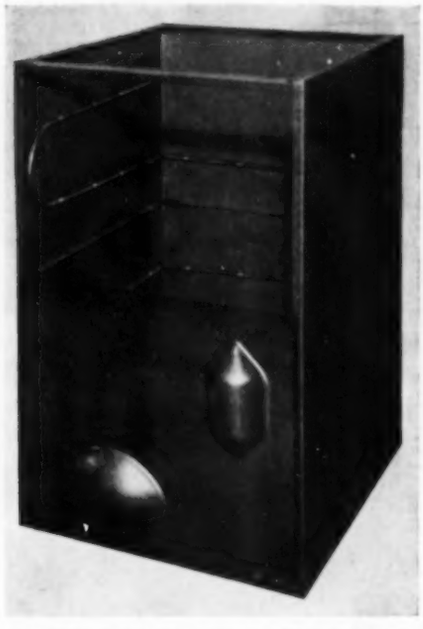
The evaporator plate as it appears after intermittent line-welding but before bending and pickling



Set in place in the food container shell the upper surface of the evaporator serves as an ice tray shelf



After being pickled, dried and tested for leaks with the copper tubes attached the evaporator is ready for assembly



With the back panel line-welded and the reinforcing angle spot-welded in position the cabinet blank is complete

Cabinet and Condenser—In order to meet the low-cost requirements of the "Liftop," it was decided to develop a new type of cabinet, again making use of manufacturing equipment already availabe to as great a degree as possible. The cabinet itself is used to form the condenser for this machine, the fins and circular condenser used on the "Monitor-Top" being eliminated.

The front, sides, and upper and lower flanges are made of one piece to which is attached about twenty feet of half-round copper tubing. This tubing is attached to the cabinet blank, while it is still flat by means of a large number of steel clips projection-welded into place. The blank and tube assembly is then folded to its final shape, the tubing being automatically formed in perfect contact with the cabinet. This folding is done in two operations, both dies being set up in a No. 9B-108-in. Bliss press so that a complete part is produced with each stroke of the press.

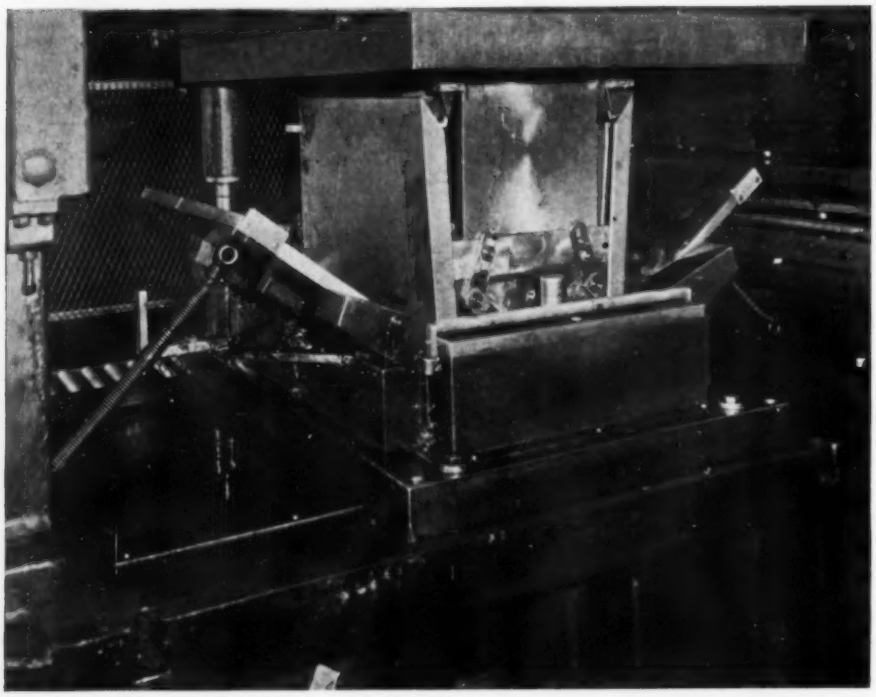
In assembly the back panel is line-welded to the sides of the main blank on a National double wheel line welder, the two seams being welded simultaneously. The mitered corners are atomic-hydrogen welded. This method is used because a clean, soft, non-porous weld is easily obtained by this method, though difficult to obtain by other methods. The reinforcing angles are then spot-welded into place and the cabinets are ground where necessary to remove weld marks and scratches. The grinding is done by means of hand disk grinders. The cabinets are then deoxidene cleaned and given a baked Glyptol prime finish both inside and out.

With the exception of the line- and spot-welding equipment, no new equipment was required for the fabrication of this cabinet, all of the jobs being adapted to permit use of equipment already available.

Cover—The cover of the "Liftop" consists of two vitreous-enameled pieces assembled together by means of hard-

wood inserts machine-screwed to clips which have been spot-welded to the upper piece prior to assembly. A perfect seal between the cabinet and cover is obtained by means of an extruded rubber gasket which is held in place by the same screws which hold the other parts. The vitreous-enameling processes are essentially the same as described above for the food container.

The cabinet blank with condenser tubing attached is laid in a press for the first folding operation



The condenser tubing is bent while fastened to the cabinet blank as the latter undergoes the second folding operation. The finished blank is shown immediately after this operation; the folding "wings" of the die have not yet returned to the horizontal position

Float Valve—The float valve used is entirely standard in every way, the same float valve being used in all General Electric refrigerators. During assembly, it is clamped to the cabinet back panel. This method of mounting affords transfer of heat to the back panel, thereby aiding refrigeration.

Control—The electric control mechanism used is a standard control which had been developed for other machines and was applied to the "Liftop" without change.

Assembly—For the assembly of this machine, practically no new equipment was required. Existing conveyors, automatic screw drivers, silver soldering equipment, etc., were rearranged to accommodate the new machine, but no additional investment was required.

Evacuation—The "Liftop" machine is evacuated by the same equipment that is used for the "Monitor-Top" models. When this evacuating equipment was installed, sufficient capacity was provided to take care of future increases in production and, therefore, no additional investment for evacuating equipment was required at this time to accommodate the "Liftop."

Charging—As in the case with the evacuation equipment, the equipment used to charge the units with the refrigerant had sufficient capacity to handle the "Liftop" and no changes were required.

Testing—The testing equipment also had sufficient capacity and no additions or changes were required in order to take care of the new machines.

Finish—After being tested, the "Liftop" machines are sent through the same cleaning and final painting operations as the "Monitor-Top" models. All white parts have previously received a baked Glyptol finish, and all black parts have either received a dipped and baked varnish or a lacquer finish. In the final paint line, all that is required is to spray on the white finish and to assemble the hardware and cover. All of these operations are done on the same conveyor line and with the same equipment used for the "Monitor-Top" machines.

Shipping—Because of their lighter weight and type of construction it is possible to ship these machines in corrugated strawboard containers.

It seems self-evident that the production of a machine of the high quality of the "Liftop" refrigerator at such a low cost was made possible by the skill with which the engineering and factory organization was able to keep development and manufacturing costs to a minimum, by standardization of parts already in production, by utilization of existing manufacturing equipment and buildings, and by concentration of manufacturing activities.

Should American Industry Adopt ISA Standard Fits?—Discussion

JOHN GAILLARD
Mechanical Engineer
American Standards Association

D. R. Miller, chief of the gage section, National Bureau of Standards, indicated a negative answer (*AM*—Vol. 78, page 536) to this question, originally raised by the present author (*AM*—Vol. 78, page 403.) Mr. Gaillard now presents a further discussion in the light of Mr. Miller's comments

THERE are too many combinations in the ISA system giving a fit of the same character, according to Mr. Miller. As a proof he gives in Table I, nine different fits with an "average looseness of approximately 0.001 in." (The average actually varies from 0.0008 to 0.00125 in.) However, only the first three of these nine fits are recommended in the ISA system. Among the other six we find such unusual ones, from a viewpoint of workshop practice, as the combination of a hole tolerance of 0.0015 in. with a shaft tolerance of 0.0004 in., and even the combination of a hole tolerance of 0.0006 in., with a shaft tolerance 0.0015 in. It is generally recognized that the size of a hole is more difficult to control than the size of a shaft. Therefore, it is difficult to see where a fit with a shaft tolerance equaling 2½ times the hole tolerance would be applicable.

Referring to the supposedly excessive variety of fits, Mr. Miller remarks: " This liberal choice raises the question as to the objective in setting up a standard of this kind." As the writer sees it, this objective is to answer the total requirements of all industries expected to use the system, with the smallest possible number of different hole and shaft limits, and consequently, tools and gages. Necessarily, such a standard will be more comprehensive than is required for satisfying the needs of any one specific industry. Now, the ISA basic hole system is based on only four different holes, for a given range of nominal sizes, and the ISA basic shaft system, on five different shafts. Also, several limits apply to a number of holes (or shafts, as the case may be), a condition making for a reduction in the total number of gages required. If these facts are taken into consideration, it appears that the proposed variety of holes and shafts recommended to cover such a wide range of fits as a national standard should do, cannot be called excessive.

Incidentally, the fact that series of specific hole-shaft combinations are recommended in the ISA system as covering the most commonly used fits, seems to contradict Mr. Miller's statement that "the ISA system in its present form does not provide any guide to the novice for selecting proper tolerances."

Selected Fits

Criticizing the ISA system on the ground that inequality of hole and shaft tolerance impairs its effectiveness where selective fitting is required, Mr. Miller gives an example of mating holes H8 with shafts n7. To judge the extent to which these parts can be mated with an interference ranging from 0.0004 to 0.0006 in., Mr. Miller assumes that first all "median parts" are assmebled (what are their limits?), and that 48 holes and 33 shafts are left over. For these, Mr. Miller assumes that their actual sizes are equally distributed over the total tolerance range, or in other words, that there are three basic holes, three holes that are 0.0001 in. oversize, etc.

If the effectiveness of a scheme of selective fitting is to be judged, it seems logical to start out from an equal number of holes and shafts. Only then can this effectiveness be measured by the number of parts that give fits of the desired character. However, if we assume that in Mr. Miller's example the number of holes and shafts are equal, why are 48 holes and 33 shafts left over, after all "median parts" have been assembled? This apears to call for further explanation.

Furthermore, it seems rather arbitrary to assume, as Mr. Miller does, that the sizes of these left-over parts are evenly distributed, between the respective hole and shaft limits. The very fact that selective fitting has to be resorted to, means that the hole and shaft tolerances can not be reduced economically, and consequently, that the sizes of individual parts within their limits are left to chance. Probably, a distribution curve of all holes under consideration ("median" and others) will show that the holes sizes will "bunch together" somewhere between the hole limits. From this "bunch," the curve will slope down toward the hole limits. The same applies to the shaft sizes. Under these conditions, the chance of getting the largest possible number of satisfactory fits is *not* necessarily increased by giving the shaft a larger tolerance. On the contrary, by keeping the shaft tolerance smaller, the shaft sizes will probably be "bunched together" more closely and, therefore, comprise a larger number falling within the range most favorable to be mated with the "bunched" hole sizes. Putting it another way, it is difficult to see why an increase in the shaft tolerance of the ISA fits (which increase would result in a wider spread of the actual shaft sizes) should give a larger number of satisfactory combinations with the main group of holes, i.e. those contained in the "bunch" of hole sizes.

Most European countries hold that allowing a bilateral tolerance on the

"not go" gage, and permitting the "go" gage to wear slightly past the "go" limit of the product (for the sake of longer gage life) causes no difficulty in practice. Several foreign national standards, now to be replaced by the ISA system, specify the gage limits accordingly. Mr. Miller's statement: "We know of no national standard in which the tolerance on the 'not go' gage is definitely outside the product tolerance" must therefore, be understood as applying only to standards in the U.S. In European national standards, a tolerance on the "not go" gage, half of which lies outside the product tolerance, is not uncommon. On the contrary, the American Tentative Standard B4a-1925 definitely states the principle that any variation in gage size shall remain within the limits on the product. In final analysis, the difference in viewpoint comes down to a matter of form, rather than one of essence. Given the same extreme limits for the product (including gage tolerance and wear) the requirements can be expressed in both ways. It is a question of speaking a certain language. In the American Tentative Standard B4a-1925, we have adopted the most logical system, in the writer's opinion. Yet, we may consider whether it is not worth while to compromise on this point, if we lay value on international uniformity, especially if it is realized that at least some gage manufacturers in this country adhere to the practice of applying a bilateral tolerance (plus and minus variation) on the size of the "not go" plug gage.

Additional Hole Desirable

Mr. Miller believes that "there is a demand for a standard hole and possibly for a standard shaft with a tolerance of approximately 0.003 in. for 1¼ in., with proportionate tolerances for smaller and larger sizes." The ISA system gives a basic hole H9 and a basic shaft h9 with a tolerance of 0.0024 in., as well as a basic hole H10 and a basic shaft h10 with a tolerance of 0.0039 in., for the diameter range from 1¼ to 2 in. While these holes and shafts do not appear in the recommended ISA *fits*, they are available to those who wish to use them.

Basic Shaft System

Mr. Miller says that "to introduce a basic shaft system in this country and give it equal status with the basic hole system will unquestionably bring confusion in manufacturing practice." The fact is that the present American Tentative Standard B4a-1925 has been criticized repeatedly for giving the basic hole system exclusively. In some industries, the basic shaft system is more economic to use than the basic hole system. Also, the Subcommittee on Tolerance Systems, of ASA sectional Committee B4 on fits and gages, has expressed the opinion that a basic shaft system should be added in the revision of the American Tentative Standard. Fear of confusion between the two systems does not seem to be justified. In general, the two systems are used by different groups, and moreover, the very existence of a standard system makes it easy to specify and identify the tools and gages required for producing the fits belonging to the two systems.

Conversion Practice

In regard to what Mr. Miller says about the conversion of the metric values, it was explicitly stated in the writer's article that the original ISA values of limits and nominal size ranges had been tentatively rounded for the sake of simplicity and that the problem of conversion should be given renewed attention, if American industry decides to adopt the ISA system.

How Shall We Get Skilled Men?

FRED H. COLVIN

LACK OF skilled mechanics is a real problem that can only be solved by careful attention to training plans and methods. Nor is any one plan or set of plans likely to fit all cases, except perhaps in principle. First of all we must decide on what kind of training is needed, this varying both with the kind of work and the shop equipment on which it is made. In few cases are the three to five year apprenticeships of the past necessary or desirable. This does not mean that highly skilled, all-round men can be made with a few months' training. But experience indicates that a comparatively short intensive training period can give a foundation that will enable a boy or man who is mechanically inclined to make rapid progress in the shop.

Modern production requires men with a variety of experience to operate the different equipment. It also needs men of different types or temperaments for various work. But with all of these variations there are fundamentals of knowledge covering machine construction and operation that affect their progress. These fundamentals can, for the most part at least, be taught and learned, in much less time than we formerly thought possible, by intensive work in a school shop under a practical instructor. Those who recall the "vestibule" schools during the war realize that much can be done in a comparatively short time.

One of the first considerations is to decide on what it is necessary or desirable for the boy or man to know. With the advent of automatic and semi-automatic machines we found they could be operated by men or women of limited training and intelligence. The main requirement was to put work into the machine, start it and remove the piece when finished. Given a temperament that does not fear machinery in operation, the necessary training could be given in a very short time. The men were simply "feeders" or "operators" with little, if any, knowledge as to how or why the work was actually performed. They could not set up the machine or change the tools, and were helpless when anything went wrong.

This very special training has disadvantages both for the operator and for management. It limits the man's opportunities of securing another job and prevents management from shifting him readily from one department to another. For a man of limited experience who lacks fundamental training in machine work is usually afraid of machinery on which he has not actually worked. His dislike for being shifted to another job is partly fear and partly objection to a lower rate of pay while he is learning to operate it. Both men and management are benefited by a training which enables men to handle several different jobs. Such training makes a more flexible work force and reduces labor turnover by utilizing men in different departments.

Training operators, however, is only part of the problem, perhaps the least important. The best operators are helpless without men who can set up the machine for new jobs, change or adjust

tools, and both locate and repair derangements or breakdowns. Then, too, there are the tool-makers, who, together with maintenance men, keep the expensive machine equipment in production. In too many plants, unfortunately, the importance of these groups is not fully appreciated when it comes to the pay envelope. Proper training for either of these groups cannot be done in as short a time as for machine operators. But it is doubtful if three-, four-, or five-year courses are generally necessary. The problem of how long and what kind of training is well worth considerable study by management.

Those who learned their trades in the shop are very likely to feel that this is the only way. And it is true that many of our best men were trained in this manner. But if one has studied the results obtained from some of our best vestibule schools during the war, as well as some of the best trade schools at present, he is likely to change his mind to some extent at least. These schools do not and cannot take the place of the shop. Their directors have no delusions on this point. But they can and do give courses that give the beginner a basis for future experience which can hardly be duplicated in any but the largest plants. Smaller shops cannot afford to maintain similar schools.

Foremen who are responsible for production have little time for teaching apprentices. Workmen whose earnings depend on their output cannot be bothered with them. Then, too, teaching requires more than a knowledge of doing, there is an art in imparting this knowledge to others. The trade school, under any name we choose, can give a beginner more fundamental knowledge than he will acquire in the average shop in many times the same number of hours.

A Running Start

With training as a basis, the plan of Lucien I. Yeomans to have the older men teach actual shop practice (*AM*—Vol. 78, page 280) is excellent. Even without this, the average shop will save time in taking boys with a good trade school training instead of starting from scratch. The well trained trade school boy will spoil less material, cause less damage to machines and interfere less with production schedules than one who comes into the shop without such training. Such boys will become efficient operators on one or more machines in a short time. Or if they are to become all-round mechanics for the contract or job shop, toolmakers or maintenance men, they have a running start.

One of the reasons for this advantage is that the trade school boy has a working knowledge of most of the machines used. He knows that gears, levers and screws perform similar functions wherever used. In other words he has acquired a "machine sense" that removes the fear experienced by the boy or man without such training. He is by no means an expert and does not pretend to be. But he can learn readily because he has a knowledge of the general principles involved.

After even the trade school boy gets into the shop he is still something of a problem. While he is far ahead of the untrained boy it should not be assumed that he needs no supervision. Much depends on the first few weeks in the shop. Sympathetic understanding will do much toward making him valuable to the company and to himself. This does not mean coddling, but consideration. Too long a time at disagreeable, monotonous work may dull his ambition and deter his progress. If circumstances make this necessary, explain the case and encourage him with what lies ahead after the rush is over.

Don't Kill His Interest

Weeks and months on a bolt cutter used to be the lot of many an apprentice, a practice that showed an utter lack of appreciation of boy psychology. One successful shop manager put his new boys with the erecting gang instead. His theory was that it gave the boy a general picture of the product, taught him the names and uses of parts and tools used, showed him what parts must be close fits and those where accurate work was not as necessary, and much other practical information. It also taught him how to work with other men. Following this the boy went to other departments and worked on the various parts made. The plan has much to recommend it. By maintaining his interest the apprentice will learn faster and more accurately.

Whether industrial managers agree with the ideas here advanced or not, they must see that it is time to consider carefully the question of training in some modern form. Skilled men are not produced for the asking, no matter what wages are offered. Foremen, who understand modern methods of both production and leadership of men, are becoming increasingly important. Neither qualification comes without actual contact with men and with machines. Intensive trade training in schools is suggested as a means of shortening the time required in the shop. It is also believed to be more economical, even if the boys are paid enough to live on while learning. This, however, is seldom necessary. The main thing is that the need for training be realized and acted upon.

A Filing System for American Machinist Articles

MALCOLM K. PARKHURST

In connection with profiting most by the many good things continually appearing in the pages of the *American Machinist*, I have just recently commenced a practice which bids fair to be of no small help, and, in the hope that it may likewise assist other readers, I am passing it along for whatever it may be worth to them.

Frequently, with the coming of each issue, I am too much occupied at the time to give it immediate attention. Or, as so often happens, even though I glance through it at the time, one or more articles deserve further study. Sometimes this condition extends to several back copies and it occurred to me that if I had some quick and easy way of locating this or that item it would be of tremendous help.

This haphazard manner of delving into back copies has been going on for some years until at last I decided to correct the matter. My practice, now, is just this: As each copy arrives I extract the full sheet containing the table of contents and paste it in a scrap-book. Such items as have a particular bearing on my own problems I mark with a red pencil directly on the contents page. In this way I have the complete contents of all the back copies directly under my thumb, so to speak, and it is a matter of only a few seconds to locate whatever article I desire. Needless to say, the actual copies of the magazine must be kept in strict file.

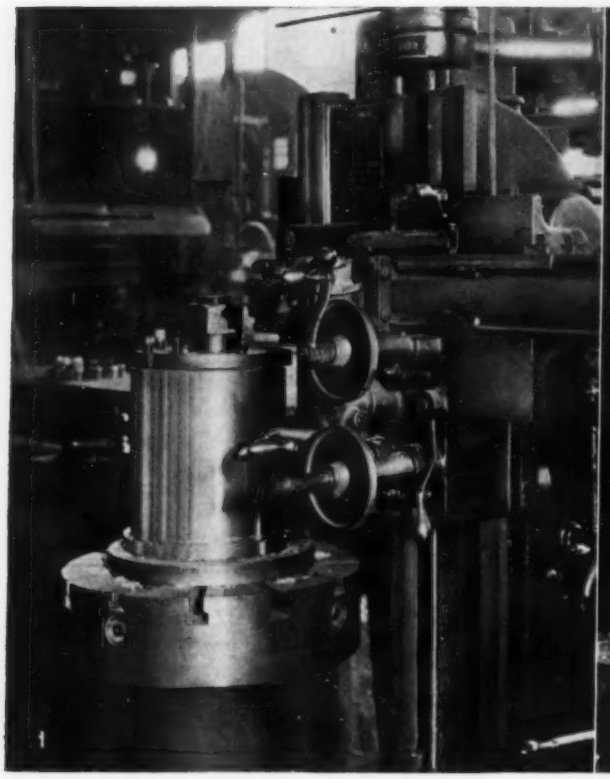
Support Trade Schools Discussion

CHARLES H. FRANCIS

I agree with much that Alfred Grayshon said (*AM*—Vol. 78, page 533) about the training of men and boys. I believe in good schools and that much of the old apprenticeship was wasted time. I would, however, modify his statement, "But trade schools properly conducted can produce first class machinists." That I feel is going a bit too far.

It takes a lot more experience than can be had in any school to make a first class machinist. The school can give a splendid start and shorten the time needed to a surprising degree. But nothing but actual shop experience entitles the man to the term, "first class machinist." Or are we mixed on our definitions?

Methods of Finishing Crown Brasses



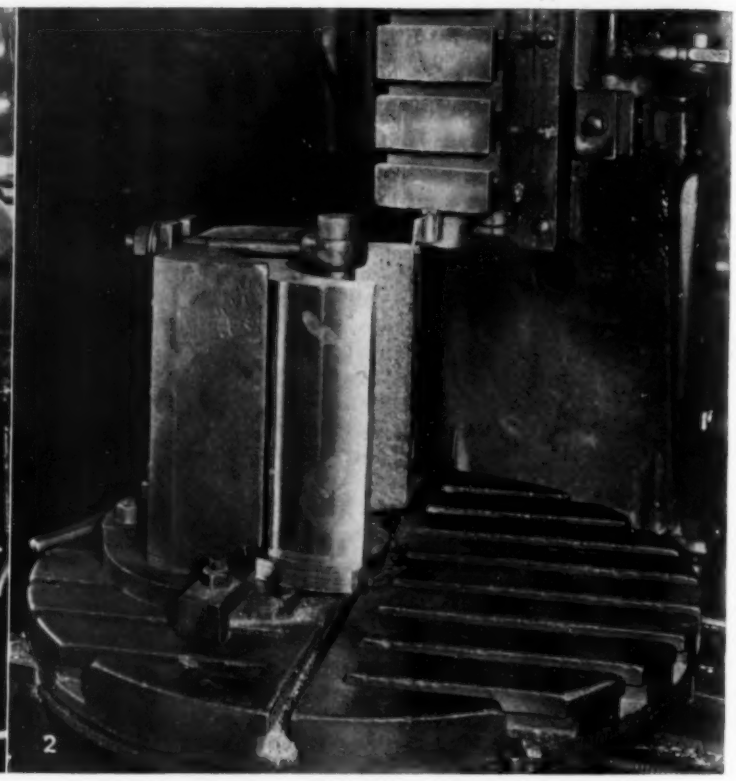
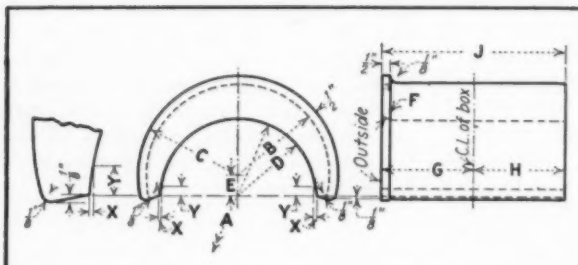
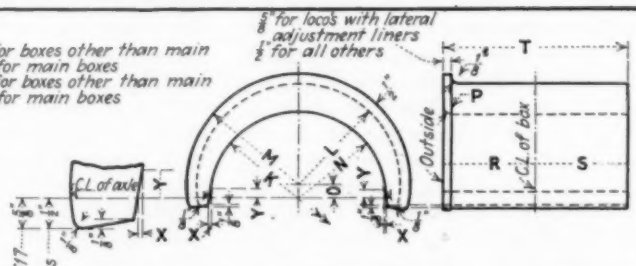


Fig. 1—Turning a crown brass on a side-head boring mill. Fig. 2—Slotter machining the edges of a crown brass to fit the driving box lip



DWG NO FOR BOX	CLASS	WHERE USED	NO	PATT NO	DIA AXLE A	B	C	D	E	F	G	H	J
C-8628	EE1,V1	FRONT AND BACK	4	10903	8½"	5¼"	5¾"	4½"	1⅞"	–	5 5/16"	5 5/16"	10⅜"
C-8631	B,EE1,J3 W1,W2,W6	MAIN	2	10900	9"	5½"	6"	4½"	1⅜"	7/16"	5 5/16"	5 5/16"	10⅜"
D-10149	E2a E2b	FRONT BACK MAIN	6	12238	10½"	6¼"	6¾"	5¼"	1"	3/16"	5⅞"	6⅜"	12"
C-8628	B,W1,W2 W6	FRONT INT. AND BACK	6	10903	8½"	5¼"	5¾"	4¼"	1⅞"	–	5 5/16"	5 5/16"	10⅜"
C-11947	G,G1	FRONT INT. BACK	6	10990	7¼"	4½"	5"	3 5/8"	1"	–	3 13/16"	3 13/16"	7⅞"
C-11947	G,G1	MAIN	2	10990	7¼"	4½"	5"	3 5/8"	1"	–	3 15/16"	3 15/16"	7⅞"
C-8628	J	FRONT	2	10903	8½"	5¼"	5¾"	4¼"	1⅜"	–	5 5/16"	5 5/16"	10⅜"
C-8628	M, M1	FRONT INT. BACK	6	10903	8½"	5¼"	5¾"	4¼"	1⅜"	–	5 5/16"	5 5/16"	10⅜"
C-8616	M, M1	MAIN	2	10900	9"	5½"	6"	4½"	1⅜"	7/16"	5 5/16"	5 5/16"	10⅜"
C-11947	T, T3	FRONT INT. MAIN BACK	8	10990	7¼"	4½"	5"	3 5/8"	1"	–	3 15/16"	3 15/16"	7⅞"
C-8637	U	FRONT BACK	4	10988	8"	5"	5½"	4"	1⅜"	–	4 15/16"	5 5/16"	10⅜"
C-8637	U	MAIN	2	10988	8½"	5"	5½"	4¼"	1⅜"	–	4 15/16"	5 5/16"	10⅜"
C-20748	LC1	ALL DRIVING BOXES	4 PER TRUCK	16351	10"	6"	6½"	5	2 1/16"	–	5 123/128	5 123/128	11 63/64
D-22709	LC2	ALL DRIVING BOXES	8 PER CAB	21027	12½"	7⅜"	7⅞"	6¼"	2⅛"	–	6 7/16"	6 7/16"	13"



DWG NO FOR BOX	CLASS	WHERE USED	NO	PATT NO	DIA AXLE K	L	M	N	O	P	R	S	T
D-31004	E3	FRONT, MAIN AND BACK	6	25488	10½"	6¼"	6¾"	5¼"	1"	3/16"	7 7/16"	7 7/16"	15"
D-16378	K1	FRONT, BACK AND INT.	6	17193	11"	6⅝"	7⅛"	5½"	⅞"	1/16"	A&B 7⅜" INT 7⅝"	A&B 7⅜" INT 7⅝"	14"
D-16389	K1	MAIN	2	17192	12"	7⅛"	7⅝"	6"	⅞"	3/16"	6 3/16"	7¼"	14"
D-22078	K1, K2a K3	FRONT, BACK AND INT.	6	19600	11"	6⅝"	7⅛"	5½"	⅞"	–	5⅜"	7⅛"	13"
D-20369	K2, K2a	MAIN	2	19603	12"	7⅛"	7⅝"	6"	1⅛"	3/16"	5⅜"	7⅛"	13"
D-10149	M2, M2c	FRONT, BACK AND INT.	6	12238	10½"	6¼"	6¾"	5¼"	1"	3/16"	5⅜"	6⅜"	12"
D-10149	M2, M2c	MAIN	2	12238	11"	6¼"	6¾"	5½"	1¼"	3/16"	5⅜"	6⅜"	12"
D-10565	X1	FRONT, BACK (INT. HP & LP)	12	12732	9½"	5¾"	6¼"	4¾"	1⅛"	O INT. 7/16"	5⅜"	6⅜"	12"
D-10567	X1	MAIN (HP & LP)	4	12731	10"	6"	6½"	5"	1⅛"	3/16"	5⅜"	6⅜"	12"
D-25685	K3	MAIN	2	22920	12¾"	7⅛"	8"	6⅜"	1⅛"	–	5⅜"	7⅛"	13"
D-25583	Y2a	FRONT, BACK (INT. MAIN (HP & LP)	16	23279	11"	6⅝"	7⅛"	5½"	⅞"	3/16"	5⅜"	6⅜"	12"
D-22078	Y3, Y3a Y4	FRONT, BACK (INT. MAIN (HP & LP)	16	19600	11"	6⅝"	7⅛"	5½"	⅞"	1/16" 2-0"	5⅜"	7⅛"	13"
D-22078	Y5	FRONT, BACK AND INT. (HP & LP)	12	19600	11"	6⅝"	7⅛"	5½"	⅞"	–	5⅜"	7⅛"	13"
D-31006	Y5	FRONT, BACK (INT. STYLE NO) (HP & LP)	12	25497	11"	6⅝"	7⅛"	5½"	⅞"	–	6⅜"	6¾"	13⅜"
D-22077	Z1, Z1a Z1b Z2	FRONT, INT. MAIN (HP & LP)	12	12731	10"	6"	6½"	5"	1⅛"	3/16"	5⅜"	6⅜"	12"
D-32292	Y5	MAIN (LP)	2	26248	11½"	6⅞"	7⅜"	5¾"	⅞"	3/16"	6"	7⅛"	13⅜"
D-30381	Y5	MAIN (L.P.	2	26517	11½"	7 5/16"	7 11/16"	5¾"	1⅛"	3/16"	6"	7⅛"	13⅜"

FIG.3

Fig. 3—Details of crown brasses with tables showing relief and dimensions of various types

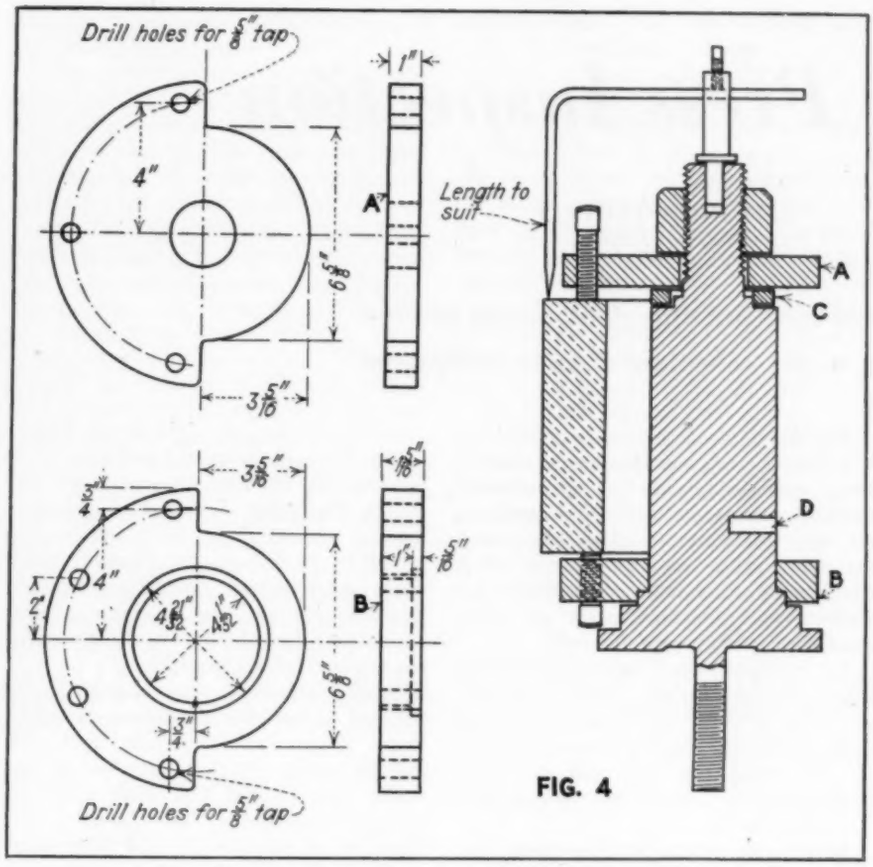


FIG. 4

Fig. 4—Chuck for holding crown brasses during slotting operations

CROWN brasses for locomotive driving boxes present machining problems that are solved in different ways in the various railway shops. Boring mills, lathes, slotters and shapers are used in this work, either singly or in combination, as in the first case shown. In Fig. 1 the brass has just been turned on a side-head boring mill, while in Fig. 2 the edges are being machined on a slotter to fit the lip in the driving box that holds the crown in place. The boring of the box is done after the crown has been pressed into place, usually on a boring mill.

The crown brass shown is of the flange type, which has been adopted by this road. The practice of this road is to bore its main brasses $\frac{1}{64}$ in. larger than the axle journal and to increase this clearance to $\frac{1}{32}$ in. on all the other axle journals.

Care is taken to relieve the bearing surface from the sides near the center line as shown in Fig. 3 and the tables that go with it. Attention to these details is considered important to prevent a tendency to pinch the axle at this point. The amount of relief recommended is shown in Fig. 3 and the notations that go with it. The ends, or points, of the crown brass extend from $\frac{1}{2}$ to $\frac{5}{8}$ in. below the center line of the axle in these cases. The relief *Y* varies from zero at the center line for main driving boxes to $\frac{3}{8}$ in. above it for the others. The difference between the centers of the inner and outer surfaces, or what might be called the eccentricity of the piece, varies from $\frac{3}{4}$ in. to $1\frac{3}{8}$ in.

Crown brasses are also turned in lathes and machined lengthwise on either shaper or slotter. The chuck or mandrel in Fig. 4 was designed and used primarily on a slotter, but can with slight modifications be used in a lathe. The only changes needed would be to provide good centers, put on a driver at one end, and arrange to swing the scribing needle on a plain portion of the stem beyond the clamping nut.

The mandrel carries two collars *A* and *B*. The collar *B* is shown with stepped diameters to fit the mandrel. By having other collars this mandrel can handle brasses of different lengths through quite a wide range. Packing rings *C* also allow for variations at that end. Pin hole *D* is for a wrench to screw the mandrel into the table of the slotter. For lathe use it would be necessary to provide means at this end for driving the mandrel and the work. The scriber is made of any convenient length to suit the arm and can be made adjustable in both directions if desired, which helps materially in locating the crown brass on the mandrel.

When crown brasses are machined in shapers they are held in a fixture which has many of the characteristics of the mandrel shown. The method of clamping is much the same but the mandrel must be held horizontally on bearings at each end and provision made for turning the mandrel and the work between strokes of the shaper ram. Some shaper builders supply special chucks for this purpose. Both regular and draw-cut shapers are used for this work.

Calculating Tap-Drill Sizes

J. ED. GALBRAITH

Many machinists find it hard to remember tap-drill sizes. Here is an easy way to calculate them.

Divide 64 by the number of threads per in., taking the nearest whole number of the quotient and calling it so many 64ths. Subtract this number of 64ths from the diameter of the tap, also in 64ths, and the remainder will be the diameter of the tap drill in 64ths of an inch.

For example: Suppose the size of a tap drill for ½-in.-13 U. S. S. threads is wanted. 64/13 = 5 approximately. ½ in. = 32/64 and 32/64 — 5/64 = 27/64 which is the size of the tap drill wanted.

The knowledge of this simple method will save memorizing the sizes of tap drills. It has been successfully used by me in the classes at trade schools. Try it for any standard thread and see how easy it is.

Center Punching on Scribed Lines—Discussion

GEORGE J. MURDOCK

Referring to the device described by H. C. Rickenbach in an article under the title given above (*AM*—Vol. 78, page 714), whatever may be thought of its practicability for obtaining accurate results, it certainly is simple and inexpensive. However, apparently no provision has been made to prevent the celluloid piece from slipping after it has been positioned on the work.

The device has the fatal defect of requiring an estimate of the accuracy with which its lines are superimposed on those of the work, and this depends entirely upon the angle at which the lines are viewed. Besides, much time would be required to juggle the device so that its lines and those on the work would be brought into coincidence.

Power Press Inspection

S. D. BROOTZKOOS
Consulting Engineer

Systematic tests not only prolong die life but also aid in the selection of new equipment

"FIRST CLASS workmanship and material are guaranteed" is the conventional phrase found in many catalogs and offers of many machine builders, including the press builders.

While the material used in the construction of presses (frames and other component parts) may be specified and the certified charts of the tests and analyses may be demanded, there are no standards or universally accepted rules for the designation of "first class workmanship" in machines.

The absence of such rules forces prospective buyers and users of presses to base their confidence and their assurance of acquiring useful and serviceable presses upon the established reputation and tradition of the plant which is building these machines.

The above practice in normal times is the best available and a well founded method of getting one's money's worth in machines. But, in these unusual times, this practice cannot be called infallible, as it does not take in consideration either business or human elements which play a part in quality.

Cut-throat competition during times of depression as well as a steady and incessant demand for quick deliveries of the machines during the periods of the prosperity times often result in hasty building of machines of a lowered standard, as shown by the bitter experience of many manufacturers during the last World War.

The purpose of this article is to outline the rules and tests which will insure that prospective buyers and users of presses get serviceable machines of good workmanship. These rules and tests may be applied to the new presses as well as second-hand, rebuilt or reconstructed machines now offered.

They may also be useful to superintendents and master mechanics of stamping shops for inspecting, testing and reconditioning presses under their care. By such control of condition and performance of presses in the plant, it is possible to reduce the upkeep costs of the dies.

The development of modern technique has forced the manufacturers associations, engineering societies, government, railroad, steamship and other purchasing agencies to adopt and to issue many standards with fixed tolerances for a number of manufactured articles, including such machine parts as bolts, nuts, shafts, keys, pins and belts.

All reputable machine builders follow these standards in the design and construction of their machines, as none of them builds his machines completely in his own plant, but buys such standardized parts from plants that specialize in their manufacture.

Ways and means for inspecting and testing such standard parts will, therefore, be considered outside the scope of this article. The present task is to give rules and regulations for the inspection and testing of completely assembled presses, giving the permissible tolerances.

The examination of the workmanship of the presses can be divided roughly in in two major parts: general inspection and the actual testing.

General Inspection

The machine should be carefully inspected for the defects in its cast and forged parts, such as blow-holes, pipes and other flaws. These defects are not allowed in parts of a press which would be under the tension or shear stress when the machine is at work.

The contact surfaces of all sliding parts should be inspected for machining marks. Light parts should be inspected for proper fit. They should not be left loose, pulled out of shape or bent by uneven, irregular or undue tightening of nuts or studs.

Shafts should not be bent nor the bushings pulled out of line, which can be easily detected by excessive tightness while turning the shafts by hand. Proper fitting of the bearings can also be detected by lubricating conditions. The lubricating oil should not ooze out nor should excessive heating of the bearings be felt in a press under power over a period of time, say eight or ten hours.

The flywheel, gears and pulleys should be checked for their trueness on the shafts. The gears should mesh properly without undue play, which can be detected by an uneven and excessive noise when under power. Since the gears are generally cut to strict tolerances, their excessive noise when at work is usually caused by faulty assembling.

Sliding members should slide freely without undue play, slackness or tightness. Proper fit of the slides and gibs can be easily detected by pressing the finger tips against the slide while it moves up and down. The change of the direction of pressure by the press connection will cause the slide to vibrate in its gibs in a case of poor and loose fitting. Clearance between the gibs and the slide for insuring their proper lubrication should be checked by feeler gages and should be about 0.0015-0.0020 in.

Press clutches should be tested for their positive, quick and proper action. The clutches should throw the presses into engagement as soon as the treadle is pressed down or the starting handle is turned to the engaging position, and should instantaneously disengage the presses when the treadle is released or the handle is returned to its starting point.

In presses equipped with a pin clutch, two sharp clicks should be heard when starting the press. The first click is of the sliding clutch pin striking the wheel hub or the driving collar on the press shaft and the second click is of the engagement of the sliding pin with the striking pin in the wheel hub or the collar. No other clicks should be heard unless the clutch is equipped with a locking pin.

In presses equipped with a rolling key clutch, one sharp click should be heard when starting the press—the click of the tail of the clutch end striking the wall of the groove in the clutch collar.

In presses equipped with a jaw clutch, three sharp clicks should be heard when starting the press: the striking click of the sliding jaw against the jaw in the driving wheel; the engagement click of

both jaw parts and, finally, the click of the locking pin.

Starting of presses equipped with hand actuated multiple disk friction clutches should be absolutely noiseless. When turning the handle and engaging the clutch, an additional resistance should be felt on the handle at the end of its movement when the toggles of the clutch mechanism pass their dead points. This arrangement insures a continuous and positive grip between the driving and driven disks in the clutch.

Magnetic clutches used in presses should be tested for positiveness, promptness and exactness of their response to the pressing of any clutch actuating buttons for starting, stopping and "inching."

Brakes should be sufficiently tight to insure holding of the slide with an attached punch in any position of its stroke and should be tested accordingly. Furthermore, the brakes should not get hot after a run of the press, say for eight or ten hours, especially in presses equipped with brakes of a continuous acting type.

Test Procedure

In connection with testing it is worth while mentioning that the total cost of dies and other press tools is often considerably higher than the original cost of the presses they are used in. A careful control of the perfomance of presses at regular intervals will, therefore, pay for itself in a short time by longer service of the dies and by lowering costs of die upkeep.

Single-Action Straight Side and Overhanging (Gap Frame) Presses

Before starting the tests, place the bolster plate in the press and tighten it to the bed of the press; then shorten home the adjustment of the press connections.

The first step in these tests is to ascertain whether the bottom face of the slide is parallel to the top face of the bolster plate. This condition insures the correct relation and position between the punch and die in the press and their proper support.

This test is made with a sensitive dial indicator mounted on a stand of a surface gage by sliding it over the bolster plate front-back and right-left under the bottom face of the slide, (Fig. 1.). The permissible tolerances for the different types and sizes of presses are given in Table I.

In all overhanging (gap frame) presses, the slide should be closer (tighter) toward the front of the press on account of the inevitable springiness of their frames under the working load.

In order to insure a longer life of the dies with a least number of grindings and to allow a correct amount of the shear in the blanking dies, it is advisable to demand from the press manufacturers the exact figures of the springiness in the press frames and in the press beds under a full and half loads of the rated capacity of the presses and to design dies accordingly.

In presses where the punch is held in the slide by a stem or shank, the next step is to ascertain whether the stem hole is perpendicular to the top face of the bolster plate and consequently to the bottom face of the slide which had already been tested for parallelism with the top of the bolster plate. This test insures proper attachment and support of the punch by the press slide, as well as correct relation of the punch in respect to the die on the bolster plate. It is made with help of a sensitive dial indicator, a mandrel held in the slide and a machinist's try square. Since the stem holes in the press slides vary with the size of the press, it is advisable to have several sizes of cylindrical ring plugs with holes in which the same mandrel can be fitted and thus be used on a wide range of presses.

The machinist's try square is now placed on the bolster plate of the press, and the deviations of the mandrel from a true perpendicular are ascertained by measuring with a sensitive dial indicator the distances between the try square and the mandrel at its upper and lower ends (Fig. 2). Measurements should be taken in the front-back and right-left planes of the press. Permissible tolerances are given in Table I.

The last and final test consists of ascertaining whether the down movement of the slide is vertical, i.e., perpen-

Table I—Tests and Tolerances for Single-Action Straight-Side and Overhanging (Gap) Frame Presses

(Based on the standards recommended by Prof. George Schlesinger)

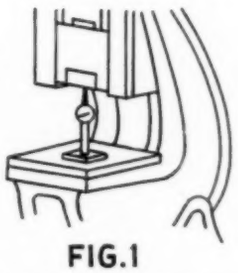


FIG.1

FIG.2

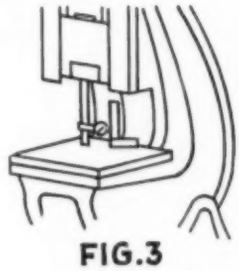


FIG.3

Test No.	Type of the Press Frame	Overhanging (Gap)		Straight-Side		
	Diameter of the Crankshaft	up to 4 in.	from 4 to 8 in.	up to 4 in.	from 4 to 8 in.	8 and up
1	Parallelism of the bottom face of the slide with the top of the bed or the bolster plate. (See Fig. 1)					
	For the measurements through the center axis of the press slide in Front-back and right-left planes:					
	For distances F-B & R-L, in.	12 & 12	12 & 12	12 & 12	12 & 12	12 & 12
	In the front-back plane, in.	0.0020*	0.0028*	0.0012	0.0020	0.0032
	In the right-left plane, in.	0.0012	0.0020	0.0012	0.0020	0.0032
2	Perpendicularity of the stem hole in the slide to the top of the bed or the bolster plate. (See Fig. 2)					
	For the tested length of the inserted mandrel, in.	6	6	6	6	6
	In the front-back and right-left planes, in.	0.0006	0.0010	0.0006	0.0010	0.0016
3	Verticality of the movement of the slide toward the top of the bed or the bolster plate. (See Fig. 3)					
	For the stroke of the slide, in.	4	8	4	8	12
	In the front-back plane, in.	0.0007	0.0019	0.0004	0.0013	0.0032
	In the right-left plane, in.	0.0004	0.0013	0.0004	0.0013	0.0032

*Closer toward the front of the press.

dicular to the face of the bolster plate. This test insures a correct relation between the punch and the die during the working stroke of the slide and excludes the possibility of shearing the dies. This test will also determine the correct gibbing of the slide.

The dial indicator is now attached to the lower end of the mandrel in the slide (or to the slide itself) touching the machinist's try square placed on the bolster plate of the press (Fig. 3). The slide is slowly lowered, and the deviations of the movement of the slide from a true perpendicular are carefully noted on the sensitive indicator touching the try square. Tests are made in the front-back and right-left planes of the press. Permissible tolerances for these three tests are given in Table I.

Wide double-crank presses of single-action type are subject to the same tests and tolerances as given above. But as the dies for wide presses are generally built with pilot (or guide) pins many a press manufacturer allows greater tolerances in the right-left plane direction, say up to 0.007 to 0.010 in., measuring from one upright to another.

Double-Action, Cam and Toggle Drawing Presses

In double-action presses only the outer (blankholder) slide is guided by gibs. The inner slide (plunger or drawing) operates inside the outer slide and is generally made floating with a play about 0.030–0.040 in. to take care in drawing operations of the uneven thickening of the metal in the walls of the drawn shells.

The outer slide in the cam drawing and in the small (with crankshafts up to 4½ in. dia.) toggle drawing presses, which is used generally for blank-cutting work, should be tested, therefore, in the same manner and with the same tolerances, as the slides in single-action presses (Table I). The plunger slide is tested, then, for parallelism of the bottom face of the slide and for perpendicularity of the stem hole to the top of the bed or the bolster plate, with the same tolerances as given in Table I.

In the large toggle drawing presses, where the outer slide is used for blank holding work only, both slides are tested for parallelism of their surfaces with the bed of the press. For tolerances see Table I. Then verticality of movement of the blankholder slide is tested with comparatively liberal tolerances, say 0.0065 to 0.010 in., depending upon the size of the press.

Horn Presses

Horn presses are tested in the same manner and with the same tolerances, as the overhanging (gap) frame presses. In addition to that, horn presses are tested for the coincidence in the same vertical plane of the center axis of the stem hole with the center axis of the horn.

The first three tests in the case of a round horn require a special fixture or they will tax the ingenuity of the inspector. The fourth test requires a special hooked mandrel, as shown in Fig. 6, interchangeably fitted to the ring plugs, used for the mandrel in the second and third tests. Permissible tolerances are given in Table II.

Table II—Tests and Tolerances for Horn Presses

(Based on the standards recommended by Prof. George Schlesinger)

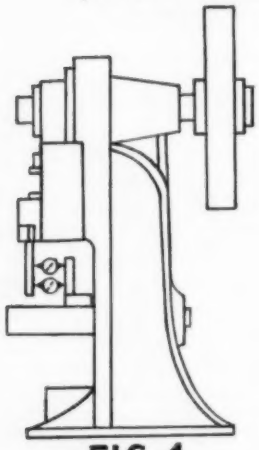


FIG.4

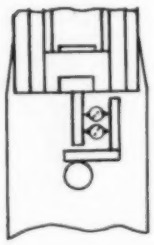


FIG.5

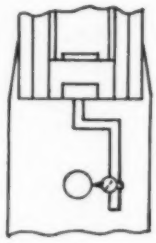


FIG.6

Test No.	Diameter of the Crankshaft	up to 4 in.	from 4 to 8 in.
1	Parallelism of the bottom face of the slide with the top of the horn. (See Fig. 1)		
	For the measurements through the center axis of the press slide in front-back and right-left planes:		
	For distances F-B & R-L, in.	12 & 6	12 & 6
	In the front-back plane, in.	0.0020*	0.0028*
	In the right-left plane, in.	0.0006	0.0010
2	Perpendicularity of the stem hole in the slide to the top of the horn. (See Fig. 4 & 5)		
	For the tested length of the inserted mandrel, in.	12	12
	In the front-back & right-left planes, in.	0.0012	0.0020
3	Verticality of the movement of the slide toward the top of the horn. (See Fig. 3)		
	For the stroke of the slide, in.	4	6
	In the front-back plane, in.	0.0007	0.0014
	In the right-left plane, in.	0.0004	0.0010
4	Coincidency in the same vertical plane of the axis of the stem hole with the axis of the horn. (See Fig. 6)	0.0040	0.0080

*Closer toward the front of the horn.

Aluminum Scores Again

Those of us who remember when aluminum was a puling infant in the industrial field appreciate the advances made far more than the younger generation. In the early days about its only claims were lightness and non-rustability. Its strength was about on a par with that of a boarding house custard pie. And now look at the stuff. Locomotive connecting rods and other parts that do a man-sized job in industry. The latest is a B. & O. hopper car, putting this road again in the lead, as it has been so many times since it laid its first rails. Known as a 55-ton car, it carries 70 tons, an increase of 15 tons in pay load with the same weight on the axle journals as before. The car weighs under 28,000 lb. and carries 140,000 lb., a much higher percentage of pay load than ever before, and one of the ways in which railroads can reduce their operating costs. This is a far cry from the days when aluminum was one of the weakest sisters.

Recording Spring Data

HAROLD L. WYNN
Executive Engineer, Pacific Electric Manufacturing Corporation

No doubt there have been occasions when considerable difficulty has been experienced in devising a system for recording essential characteristics relating to compression springs. In attacking a problem of this character it becomes necessary to make thorough investigations into stresses, working stroke, initial compression and relative clearances; in fact into all requisites pertaining to a comprehensive analysis of springs.

How many drawings of springs reflect the results of previous calculations? In this connection, if the first design-attempt does not fill the requirements, it is necessary to start anew, for often the original computations have either been destroyed or mislaid. It was with the idea of preserving a permanent record that the spring chart illustrated was formulated. Primarily, it consists of a graphic illustration of those values that are paramount for future reference, either for future consideration or for reviewing problems that are similar in general character.

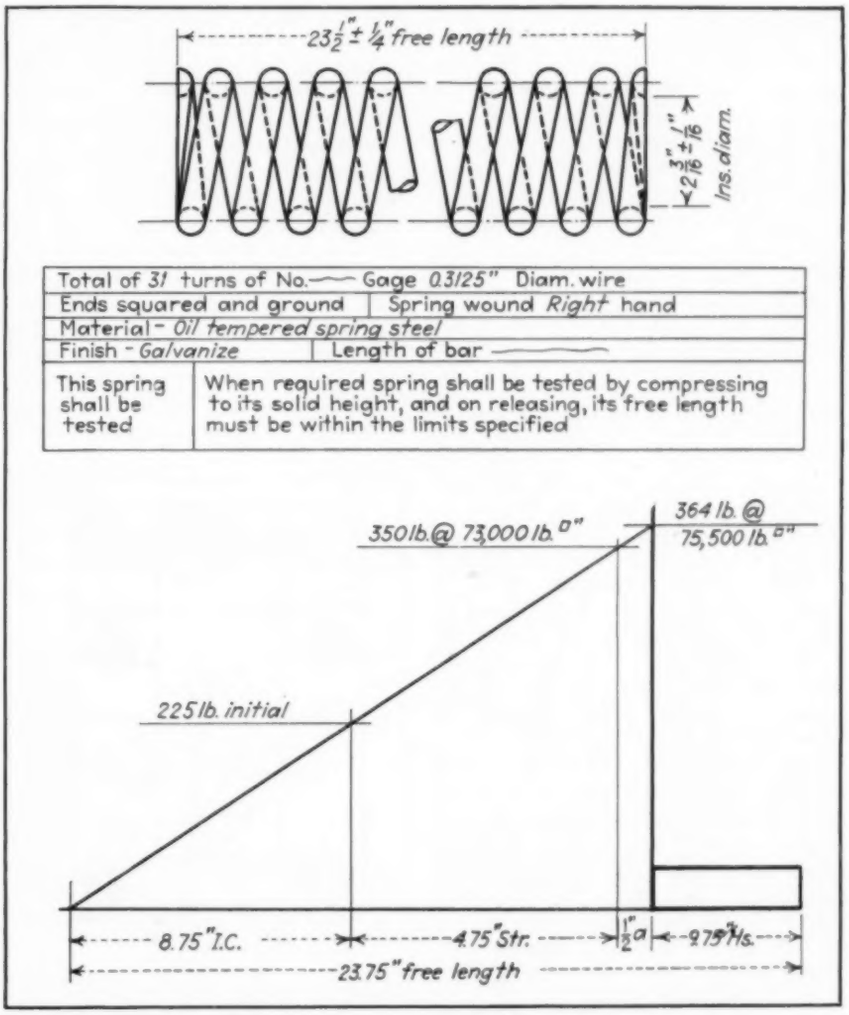
The bottom line of the chart is the basis of operations. Its entire length represents the free length of the spring. Starting at the right, the figure 9.75 in. *Hs.* denotes the value of the solid height. The notation ½ in. *Cl.* stipulates the clearance allowed before the spring reaches its solid height. In the center, 4.75 in. *Str.* discloses the active stroke through which the spring is extended or compressed in unison with the mechanism to which it is applied. At the left, the symbol 8.75 in. *I.C.* denotes the initial compression of the spring. In other words, the spring has been previously compressed to this height to obtain a predetermined energy output.

Rising from the base line are several ordinates coinciding with the one drawn from zero spring-pressure to the maximum when the solid height is reached. At each point where the ordinates cross the pressure slope, values in pounds are listed. In addition to the actual energy that may be delivered at the various coordinating positions, the fiber stress is given in pounds per sq.in. For example, with the spring compressed 13½ in. the fiber stress will be 73,000 lb. per sq.in., and when the spring is compressed solid the fiber stress will be raised to 75,500 lb. per sq.in. All the values given in the chart have been arrived at from previous calculations. In no case has there been any attempt to make the relations to scale, as it has been the sole intention to record the principal mathematical results, and not how they were procured, the paramount requisite being to perfect a form that would serve the greatest number of known variations.

The chart must include all elements that are common to compression springs. Compression springs are especially mentioned because springs of most other types have so many variables that it does not appear to be economical to prepare their data in the form of basic drawings. Nevertheless, the general scheme of a chart and the associated data should have universal application. It is important that springs be tested at their solid height, and it is for this reason that the fiber stress must be given for that point.

In the general run of spring steel, it has been found that the limit of fiber stress is in the neighborhood of 75,000 lb. per sq.in. If higher values must be had, then an alloy steel must be specified. A spring that is to be worked close to the maximum fiber stress should not be tested beyond that point or it will take a permanent set. For example, if a spring of ordinary spring steel must be worked to a fiber stress of 75,000 lb. per sq.in., and at its solid height it shows a fiber stress of 85,000 lb. per sq.in. it is evident that it should not be tested above the safe fiber stress of 75,000 lb. The size of the spring material should always be given in decimals.

Generally, once a spring drawing has gone to the production unit and the components resulting therefrom have been made a part of shipped equipment, it should never under any consideration be revised or altered in any way. Instead, make a new drawing.


23½" ± ¼" free length
3" ± 1/16"
2 1/16" Ins. diam.
Total of 31 turns of No. — Gage 0.3125" Diam. wire
Ends squared and ground
Spring wound Right hand
Material - Oil tempered spring steel
Finish - Galvanize
Length of bar
This spring shall be tested
When required spring shall be tested by compressing to its solid height, and on releasing, its free length must be within the limits specified
350 lb. @ 73,000 lb. per sq. in.
364 lb. @ 75,500 lb. per sq. in.
225 lb. initial
8.75" I.C.
4.75" Str.
½"
9.75" Hs.
23.75" free length

All the necessary data are recorded on this chart. The junction of the ordinates with the pressure slope shows the fiber stress at the pressures given

Efficient Jigs Fabricated From Steel

FRANK HARTLEY

Examples show how steel plates can be cut and welded into fixtures without waiting for the pattern maker or the foundry

WHEREVER PRACTICABLE, the cheapest jigs are usually those built up from commercial steel members, and there is considerable satisfaction in being able to say, "They didn't cost much; we built them out of a few pieces of cold-rolled steel." The accompanying illustrations are of jigs of such a type.

In the jig in Fig. 1, two blind holes are to be drilled in the segment *A*. The entire locating is done by the pivoted member *B*. It centers the work radially in the V-slot *C* and locates it sidewise therein. An additional function of member *B* is to clamp the work by forcing its flat surface against the under side of the bushing plate *D* by means of screw *F*. In placing and removing the work, the free end of member *B* must be dropped down considerably, the amount being indicated at *H*. The pivoted block *J*, against which screw *F* abuts, is swung outward from under the screw, permitting the free end of member *B* to be dropped to the base of the jig.

Bushing plate *D* is held by the four shouldered posts *K*, and the under side of the jig base is cut away so as to leave two resting spots or feet at *L*. When another segment is put in the jig, pivoted member *B* is lifted up block *J* is swung inward under the point of screw *F* and the screw is tightened to clamp the work against the under side of the bushing plate. The clamping action rocks the segment so that its flat surface is brought square against the under side of the bushing plate.

A jig of rather unusual design is illustrated in Fig. 2. The work to be drilled and reamed is a ribbed casting of semicircular shape. The various bushings are of reamer size and the first operation consists in spotting the holes with a short drill of full size and then drilling through the work with a smaller drill, leaving enough stock for reaming with a machine reamer.

The primary object is to locate the work from its central point, since the outer ends are to be machined to shape after drilling and reaming have been completed. The work *A* is held against the central block *B* by the inverted V-block *C*, which is attached to the sliding bar *D*, engaging a slot in the work The work is clamped by two knurled thumbscrews *F* and bears on the clearance bushings *H*. The sliding bar is held down by plate *J* and passes through a slot in the under side of the central block *B*. It is operated by screw *K* which is threaded into block *L*. Plate *M* carries a bushing through which the central hole *N* is drilled and reamed, and the two end plates *O* have bushings at *P* to guide the drill and the reamer for the end holes.

To remove the work, the knurled thumbscrews *F* are backed off, screw *K* is loosened and the spring *S* pulls back the sliding bar and the inverted V-block a sufficient distance for clearance. The work can then be lifted up at the center and removed by sliding it from under the bushing plates *O*. In placing the work, it is slid under the bushing plates from the front and the inverted V-block is brought into engagement with the slot in the center by screw *K*, centering the work against the central block. Knurled thumbscrews *F* are then screwed down on the rib.

In providing the type of clamping device in the jig illustrated in Fig. 3, consideration was given to the fact that the work *A* had to be clear of the tongues *B* in the base of the jig to permit it to be placed and removed. The illustration shows the overhanging portion of a large jig in which the unit shown is one of two used as a locating means. The work has a long, finished slot and is located by the finished surfaces *C* and *D*. It is clamped in place by the screw *F* in the hinged bushing plate *H*, which is free to swing about pin *J* as a center and is held in a horizontal plane, so that the bushings are at a right angle to the work, by the collar *K* on the pivoted screw *L* contacting with a boss in the base of the jig. The collar is pinned to the pivoted screw and an inverted V-projection engages a V-notch in the boss and holds the screw in a vertical position. When the knurled nut *M* is backed off, the

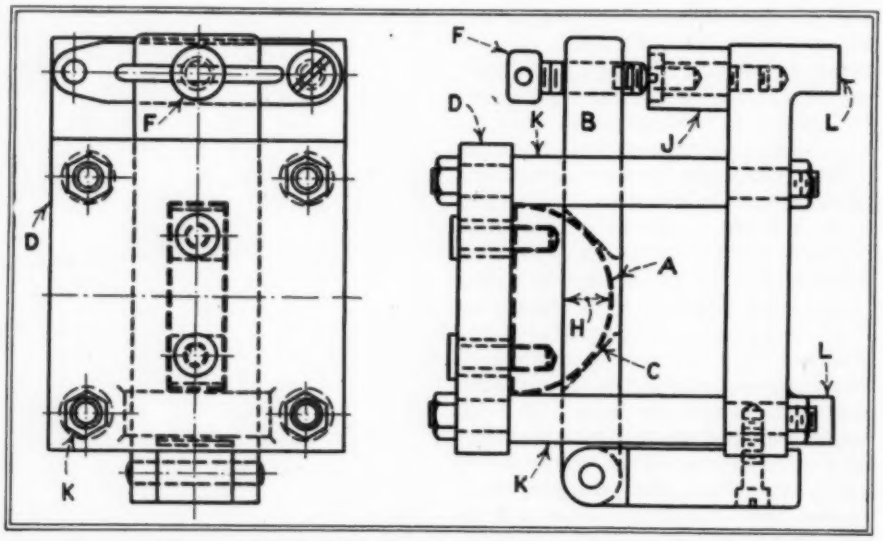


Fig. 1—The work is both located and clamped by member *B*. It is held in a V-groove and its flat surface is forced against the under side of the bushing plate

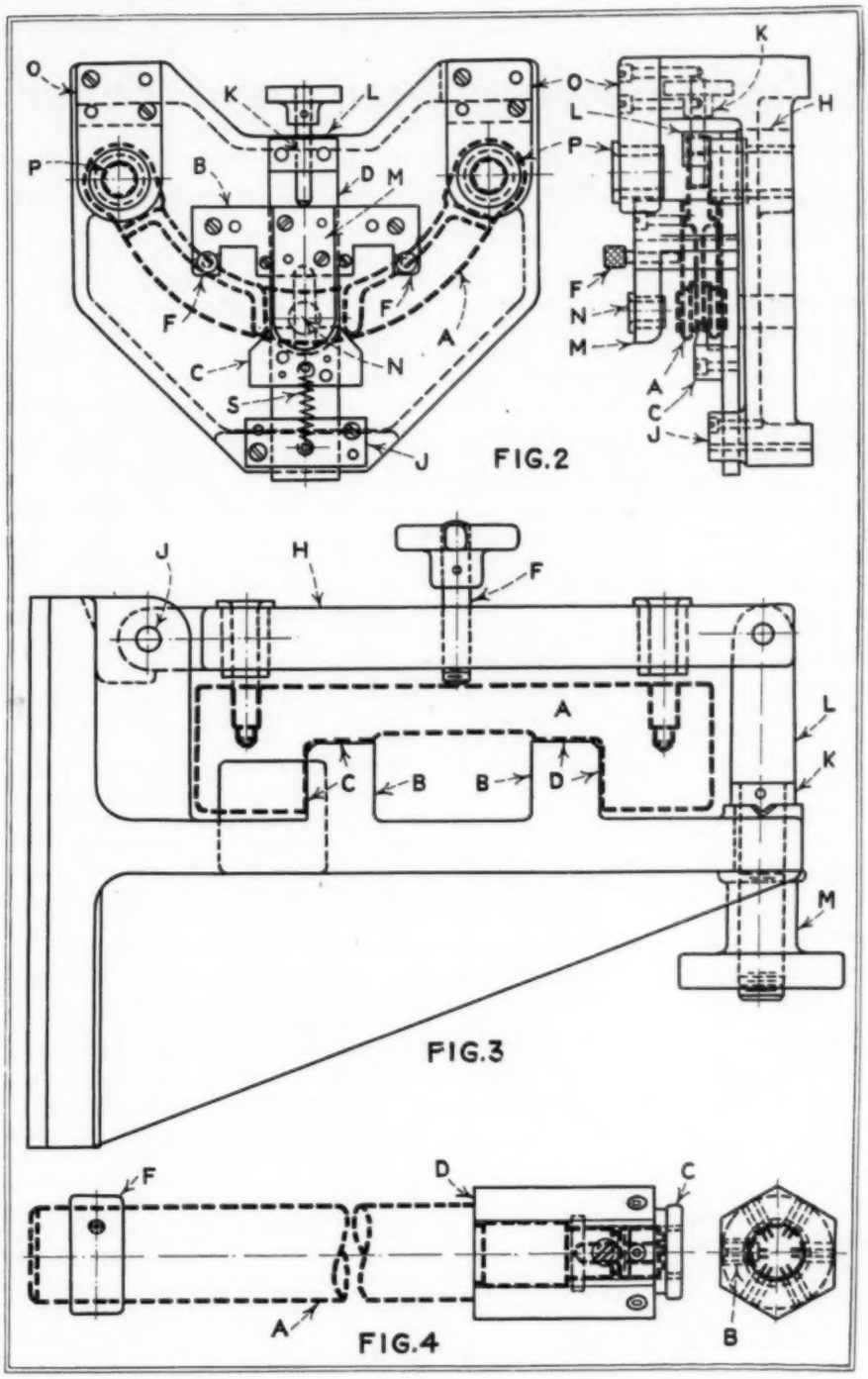


Fig. 2—The semicircular casting is centered against the central block by a sliding, inverted V-block engaging a slot in the center. When the clamping nut is loosened, a spring disengages the V-block from the slot

Fig. 3—One of two units used for location of work in a large jig. Location is by tongues in the base engaging a slot in the work. The work is clamped in place by a screw in the bushing plate

Fig. 4—Instead of drilling three holes completely through the threaded end of the shaft for a cotter pin, six holes are drilled halfway through, meeting in the center, in this hexagon, roll-over jig

pivoted screw can be swung clear of the base, and it and the bushing plate can be swung clear of the work.

Simplicity marks the design of the jig in Fig. 4, the function of which is to hold and index the end of the shaft *A* while six holes are being drilled for a cotter pin. Ordinarily, three holes would be drilled clear through the threaded end of the shaft, using but three bushings. However, it was found to be more satisfactory to drill six holes meeting at the center: besides, a shorter drill could be used.

The body of the jig is hexagon in shape and is rolled over on successive faces in drilling the holes. It is bored to fit the threaded end of the shaft on which it is located by the reduced point of screw *B* engaging a keyway. The knurled nut *C* engages the end threads of the shaft and holds the jig against the shoulder *D*. In addition to the jig itself, the collar *F* is placed on the shaft and acts as an outer resting point to support the shaft so that it will be aligned with the hexagon faces of the jig.

Junk Still in Use

PAUL KORNAU

Your first cover editorial (Vol. 78, No. 16) outlined the main reasons for the poor showing made by the machine tool industry.

Why should this branch of business be continually hard up when nearly every other manufacturing enterprise depends on it? Certainly conditions are far from what they should be, but just take a look at the automobile or the electric appliance manufacturers. Some of these companies have enjoyed exceptional business and profit. Did they sit back and wait for the orders?

For 25 years the writer has worked in many manufacturing shops in which accurate work was expected from the operator. And what tools there were to work with! In some of the largest shops, employing over 500 skilled mechanics, you will find today that 25 per cent of the machine tools now in use are over 25 years old.

Just recently I worked on some drill presses and lathes that were 35 years old. The rest of the equipment is from 25 years old on down, the average being 18 years. Now an 18-year old tool, no matter how carefully it was used, does not fit in the modern shop where quality work is done. So many improvements have been made in the new tools that it seems hard to believe that efficient salesmen cannot get the orders. There are 3,000 machine tools right now in daily use in Cincinnati that should be on the junk pile.

Gage for Checking Bores for Angularity and Taper

J. H. BOULET, JR.
General Household Utilities Corporation

FIG. 1 shows a gage for checking the bores of refrigerator-pump bodies for both angularity and taper. To pass inspection the angularity of the bore with either end must not be greater than 0.0002 in. at a given point called the seal line. At all other points a limit of 0.0003 in. is permitted, but the bore must not exceed 0.0004 in. in taper.

Essentially, the gage consists of the base *A;* the serrated plate *B;* the lever *C;* the hardened bushing *D;* the pressure pad *F;* the eccentric pin *H;* the bracket *J;* and the dial gage.

The plate *B* is serrated, hardened and lapped flat. Its surface is ⅛ in. smaller in diameter than that of the part to be gaged. This is important because it prevents the plate from wearing hollow from constant use. Lever *C* is cold-rolled steel and is casehardened at the indicating end. It has two tungsten-carbide gaging points, one to contact at the top and the other at the bottom of the wall of the part being gaged. The top point only is indicated at *K*. The fulcrum is half way between the gaging points and consists of the hardened bushing *D*, on each end of which is a ⅛-in. steel ball held in place by cup-pointed setscrews. The lever is so proportioned that the readings on the dial gage are double the amount of its movement.

The bracket *J* is attached to the under side of the base and is fitted with adjusting screws to limit the movement of the lever. The pressure pad *F* is opposite the fulcrum of the lever and is operated by the eccentric pin *H*. When the pressure pad is against the right-hand side of the wall, the pressure on that side brings the opposite side of the wall into contact with the gaging points on the lever. When the part being gaged is rotated by hand, the gaging points ride on the wall of the bore and the dial gage reads from maximum to minimum.

The dial gage reads to 0.0001 in. and to set it, a master ring gage in which the bore is straight and accurately at 90 deg. to the ends at a marked point is placed in gaging position. The two screws *L* have heads of the same radius as that of the bore of the part to be gaged. They are so adjusted as to minimize the side play or clearance of the part.

In checking the part for angularity of wall and taper of bore, it is placed on the gage, the pressure pad is released and the part is revolved once or twice. Assuming that the dial gage reads plus 0.0006 in. at maximum on one side, and at the opposite side it reads minus 0.0002 in., it means that the wall is out of square with the end one-half of 0.0006 in. and that the side opposite is off one-half of 0.0002 in. It will also be noted that in these same positions the maximum taper of bore is equal to one-half the difference of the figures on oposite sides of zero. In this case the difference between 0.0006 in. and 0.0002 in. is 0.0004 in. Since the ratio is two to one, the amount of taper is 0.0002 in. as shown in Fig. 2. As is shown in Fig. 3, should the dial gage read plus 0.0006 in. at the maximum point and plus 0.0004 in. one the side opposite, then the taper is equal to one-half the total of both readings, or 0.0005 in. If both readings are minus, the same rule applies.

If the operator gets a reading on the dial gage of more than 0.0006 in. from zero, the part is rejected. If one-half of the total of the two readings is more than 0.0004 in. it is also rejected. The body bore, which is ground and honed, is held to a limit of 0.002 in. and is gaged separately. It is surprising how easy it is to split 0.0001 in. with a gage of this type. The only adjustment that has been found necessary in years of use, is adjusting the two screws *L* occasionally to keep a minimum clearance between the gage and the bore of the part.

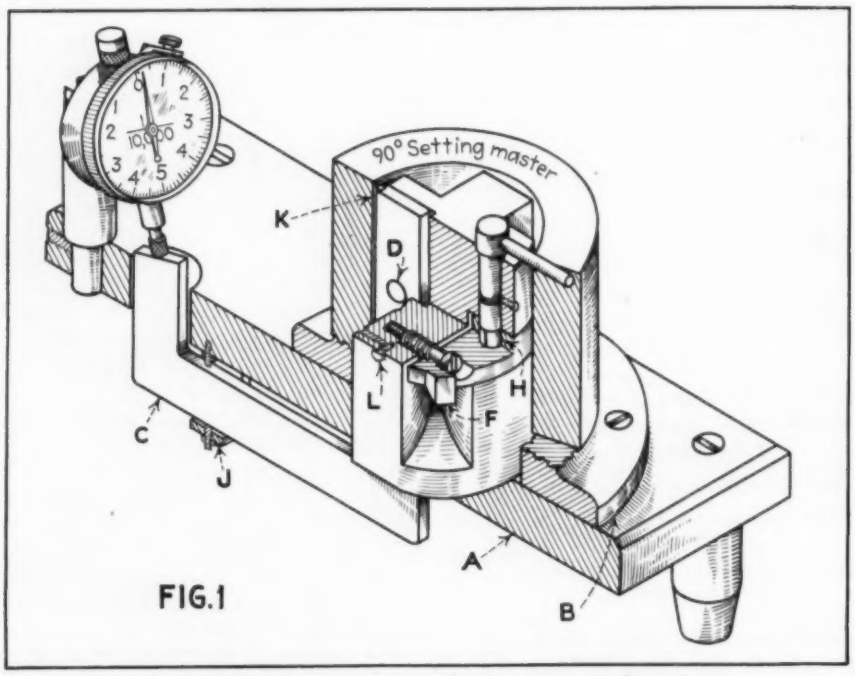
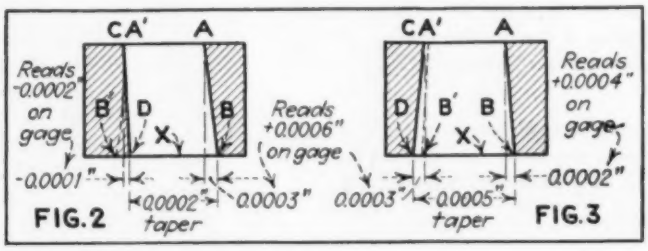


Fig. 1—Where the bore of a cylinder is tapered, or is out of square with the ends, it can be accurately checked with a gage of this type

Figs. 2 and 3—Indicating the difference in results when one reading is plus and the other is minus, and when both are either plus or minus



EDITORIALS

VOLUME 78 AMERICAN MACHINIST ESTABLISHED 1877 McGRAW-HILL PUBLISHING COMPANY, INC. NUMBER 24

K. H. CONDIT F. H. COLVIN
EDITORS

UNCLE SAM—MANUFACTURER

A FEW MONTHS AGO only the out-and-out Communist suggested that the government go into general manufacturing. Even the left-wing Socialists confined their platforms to federal operation of "natural resource" industries.

Now mattress factories and canneries are being operated by the government with government funds. This drastic step was taken without debate and without mandate by the Congress or the people of the United States. It was put across by a government bureau, the Federal Emergency Relief Administration, through its state agencies, with the consent of Harry Hopkins, its head.

Local business groups in the communities affected, apparently with an incomplete understanding of the implications of this program, have aided and abetted the Relief Administration. They have forfeited some of their cherished independence in order to reopen plants in their communities that failed in competitive enterprise.

While the number of such plants is still comparatively small more have been projected. Once started and in full operation, backed by taxpayers' pocketbooks and with their markets assured, these government plants will be almost impossible to liquidate. Even with the return of recovery the political pressure against closing them will be well nigh irresistible. And their very existence will render the return of recovery more remote.

Their excuse for being is fallacious. Despite the fact that their output is designed for the needy, they take work from privately owned plants and from wage earners in those plants. This will lead to a greater depression in private enterprise and a continually increasing federal payroll with the inevitable deficits due to inefficient bureaucratic operation.

PROTESTS have already arisen against this unwarranted intrusion into private enterprise, and there are indications that they have had good effect. A proposal by the relief authorities to make leather into shoes in government factories has been abandoned. Administrator Hopkins has announced an exit from the mattress business when the present supply of cotton on hand has been exhausted.

But these protests must continue in increased intensity until the FERA and all other governmental agencies crawl back to their own side of the fence. For if the present trends of the bureaucrats are allowed to continue uninterrupted we shall soon be in the morass of state socialism.

Moderation

ALL SORTS of wild stories and rumors about the flood of social legislation that is to be let loose on us by the next Congress, on the recommendation of the Administration, have been bothering business men. No one knew where the President stood and some of his less enthusiastic admirers feared the worst. Their fears should be allayed by his pronouncement to the National Conference on Economic Security last Wednesday that he was against "fantastic schemes," and that he thought it would be enough to put through a workable unemployment insurance law in this coming session. Moderation ruled where extremes were dreaded.

Exit Alibi

WITH the passing of Election Day another hard-worked alibi of the timid business man has been removed. Depending on his political point of view, he now knows the worst, or the best, and he can plan accordingly. We are certainly going to be run by the Democrats for two years, and possibly six, so we might as well get used to it. Business must go on, if for no other reason than to make the money to pay the taxes. We have always believed that the business animal, like the human animal, can adjust itself to almost any set of circumstances, so long as they remain reasonably constant. With the exit of the election alibi our belief can be tested. We have faith that it will stand the test.

.CHIPS.

Washington—Roosevelt receives amazing vote of confidence as Democrats, contrary to all traditions, make gains in mid-term election . . . Secretary Roper says right to work is just as sacred as right to strike . . . First rumors on new national budget indicate little change in total, more money for Army and Navy, supply bills to come ahead of emergency measures . . . Senator Borah asks inquiry into federal relief wastes . . . Roosevelt picks committee of nineteen representing business, labor and social welfare groups to advise his Committee on Economic Security on social legislation . . . FERA planning shops for unemployed in which supplies for relief will be manufactured . . . Secretary Swanson and Congressman Vinson advocate expansion of naval air service by building carriers and dirigible . . . President names group to consolidate work of federal lending agencies . . . Tells social workers he is for unemployment insurance legislation now, other reform measures in the future.

Foreign—French cabinet resigns, police quell Paris riots, Flandin forms new cabinet so promptly that further disorders are avoided . . . Japan stirs up three international controversies, secure in the belief that the Occident has too many internal troubles to make a fight . . . Raids disclose Nazi espionage and plans for controlling Saar elections, situation tense . . . Mussolini sets up his corporative state by installing directors of 22 corporations, of all of which he is president, to conduct the affairs of Italian business and industry and to succeed the Chamber of Deputies . . . Concentration of American automobile and airplane leaders in Moscow lends color to rumors that Soviet debt settlement is at hand . . . France and Italy backing U. S. on maintaining 5-5-3 naval ratio . . . Belgian cabinet resigns over monetary dispute.

Finance—$175,000,000 in bonds voted by various states . . . Association of Reserve City Bankers says its members have deposits of $13,000,000,000 and have established credit lines of $6,000,000,000 of which $1,950,000,000 has been used . . . Estimate $8,000,000,000 to $10,000,000,000 of unused credit available . . . Heavy gold exports from Europe are on the way here . . . RFC has plenty of funds, will need none from next Congress, says Jones . . . M. S. Eccles, advocate of recovery through spending, succeeds Eugene Black as head of Federal Reserve Board . . . Committee of bankers appointed to advise Export-Import Bank officials . . . Treasury removes foreign exchange restrictions except those on gold, no particular economic effect expected . . . Home Owners' Loan Corporation exhausts its appropriation and will receive no more applications.

Industry—Murray Body plans to rearrange and enlarge plant on strength of heavy Ford orders . . . General Electric announces inauguration of permanent unemployment pension plan to succeed temporary arrangement that has operated since 1930 . . . Six companies share Illinois Central order for eleven oil-electric switching engines . . . General Motors announces plan to stagger introductions of new models in order to stabilize unemployment in automobile industry . . . P.R.R. orders 57 additional streamlined electric passenger locomotives for New York-Washington service to begin early next year . . . Labor Board rules that plants cannot be moved to another location to avoid labor contracts . . . Ford to reopen two assembly plants, St. Louis and Long Beach, closed since 1933.

Trade—Germany bans American automobiles and nearly 20,000 Germans may lose jobs in consequence.

Indicators—Steel production continues its slow expansion . . . Carloadings down . . . Electric power output up . . . Business Week's index up nearly a point.

Auto Plants Plan Reequipment During First Half of 1935

A production of 130,000 cars and trucks is indicated for October as compared with 138,365 last year. The past month's factory shipments of members of A.M.A totalled 90,377 units, a decrease of 22 per cent under September and 11 per cent less than last year. Ten months' production this year, however, shows a gain of 31 per cent over the 1,404,311 output in the same period last year and 24 per cent greater than the total output of 1933, according to A.M.A. figures.

September sales at retail were slightly over 184,000. October sales, stimulated by price reductions, greater merchandising efforts and improved consumer income, are estimated to run ahead of the 164,384 sold in the same month last year. Sales of General Motors cars and trucks in this country in October were 69,000 compared with 71,648 in September. Scattered reports indicate that November sales are well maintained. Hudson and Terraplane sales the first week in November were greater than any week since 1929; Chrysler dealers sold 200 more cars in the same week than the week previous. Pontiac sales the last ten days of October were the highest in any comparable period since August, 1000 more cars being sold than anticipated for the month; Cadillac sales the last ten days of October exceeded every ten-day period since May; and sales of cars in Wayne county, which includes Detroit, were 479 for the week ending November 8, compared with 539 the previous week.

With many plants closed during October for inventory and revamping of lines, dealer stocks are expected to show shortages in some lines before 1935 models are ready.

Beginning in October, the small die business of Detroit tool and die shops has been humming, which indicates that mechanical changes are being made. For several weeks commentators have been saying that only body lines would be corrected in the new models, but indications now are otherwise. It is reliably reported that radical changes will invade the low-priced field in the case of at least one maker. Just now a stiff fight is on between the coil and leaf spring manufacturers as to which form of wheel suspension shall rule; the same advantages at a reduction in cost of up to $14.00 per car are claimed by the latter. This movement of the leaf spring manufacturers is an interesting case of coordinated action in the field of engineering development, having no relation to price or production control and offers a blazing example to other code groups.

The absence of agitation in the tool and die industry this fall as compared with last has resulted in an appreciable increase in efficiency of tool and die makers. Indications are that the neglect of apprentice training is becoming increasingly evident as time goes on; in one case only 25 men presumed to have the requisite skill were selected out of a total of 200 answering an ad for a particular skilled operation, and some of those 25 were later found wanting. Some shops are considering introducing this form of training in the near future.

Indications are that interest is developing rapidly in new equipment investments; the Ford announcements are only an indication. Earnings have not kept in step with the increase in business this year; Chrysler earnings in the September quarter were only 29 cents per share as compared with $1.67 last year; General Motors sales increased 36 per cent the first ten months of this year and earnings only 15 per cent; other units have made less favorable showings. With wages per hour near an all-time peak, it is evident that movement to reduce costs through better equipment is in order.

Prices on new models, if the Hupp new price structure is an indication, will be lower rather than higher on the new lines. The stage is thus set for the rapid strides made in machinery development to show to best advantage. The Packard light-car cylinder line is guaranteed to machine the block at a very low figure. Several manufacturers are known to be giving thought to the matter with strong likelihood of there being many lines completely revamped within the next few months. An optimistic estimate from an informed quarter is that fifteen million will be spent for equipment in this area within the next six months, excluding the Ford steel program.

Hupp Motor's 1935 models were placed on display in dealer show rooms the first week in November with the series 517 at a list price of $695. Thus Hupp, for the first time invades the low-priced field, this model with improvements selling for $100 less than last year. With two previews in the bag, several announcements are anticipated in December. The General Motors announcement of staggered introduction of models as a means of spreading employment is not expected to affect new showings in January with possible exception of Buick and Cadillac.

Extension of the automobile manufacturers' code to February 1 in its present form is followed by an announcement of F.W.A. Vesper, retail code administrator, that manufacturers' support will be given to the retailers. The National Industrial Recovery Board furthermore approved an amendment to the retail code authorizing members to enter into an agreement for payment of penalties for code violations. U. S. Judge E. S. Vaught, on November 12, throws a wrench into these stabilizing developments by declaring fixed prices on trade-in cars unconstitutional. The decision was rendered in Oklahoma City.

The Ford 1,000,000 or better program for 1935 results in a rearrangement and improvement program at Murray Body — Ford merchandising moves increases tempo of entire industry—Citroen 11-hp. front-drive car success lends fuel to similar American developments—Buick rearranges field organization apart from Pontiac — Detroit will play host to automobile dealers and the Society of Automotive Engineers during show week, January 12 to 19—Hupp closes its Cleveland body plant, sending the machinery to Hays Body Corporation.

National Founders Hear Criticisms of New Deal Policies

Speakers at the annual meeting of the National Founders Association at the Waldorf Astoria Hotel in New York City, November 14 and 15, were practically unanimous in their statements that certain features of the New Deal are dangerous to American individualism and private business as it has been conducted in the past. Thomas W. Pangborn, president of the association, proposed the following steps to be taken by the Administration to revive private industry and stimulate reemployment:

1. Balance the national budget.
2. Reduce direct relief expenditures.
3. Stabilize the currency.
4. Withdraw all government competition with business.
5. Stop Public Works expenditures for facilities that duplicate existing facilities or for which there is no economic need.
6. Declare a truce in labor relations and preserve status quo until we have reached a period when settlements can

be based on logic and discussion rather than on emotion.

Dr. Jordan said that we must decide within the next six months whether private enterprise or the government is to reemploy those out of work. It is his feeling that government employment is progressive and irreversible and that it cannot function successfully side by side with industrial reemployment. He went on to say that five steps are necessary to complete nationalization of all social enterprises. These steps are:

1. Nationalization of credit.
2. Nationalization of power resources.
3. Nationalization of transportation.
4. Nationalization of agriculture.
5. Nationalization of labor.

The first three are well advanced and the fourth and fifth are under way. If they are completed we shall have a political system that combines some of the Italian and some of the Russian developments. If, on the other hand, we choose to revert to a policy of individual initiative we should do these things:

1. Get relief back into the hands of the States as quickly as possible and finance it by loans to the States rather than by direct grants.
2. Develop a system of federal subsidies for wages in industry.
3. Maintain the NIRA practically as it is.
4. Maintain the Securities and Stock Exchange Acts and trust to better administration to make them workable.
5. Amend the income law to allow abatement of gross income of both individuals and corporations for purchases of certain types of durable goods.

J. A. Milholland, vice-president, Bank of the Manhattan Company, reviewed the monetary situation and expressed his opinion that the preponderance of Democratic votes in the recent election, 15,000,000 to 12,000,000, was not sufficiently heavy to warrant experimentation with a new economic system. His recommendations for steps leading to recovery were:

1. Stop building public works that are not needed.
2. Coordinate federal and State relief with ¾ of the amount to be met from taxes.
3. Stop tinkering with the currency.
4. Go on a gold basis at $35 per ounce. Repeal silver legislation and the Thomas amendment.
5. Announce the maximum federal loan requirements for the next two years.
6. Balance the budget for the fiscal year ending in July, 1936.

At the final session of the convention the officers, Thomas W. Pangborn, president; F. H. Clausen, vice-president; A. E. McClintock, commissioner; and J. M. Taylor, secretary-treasurer, were re-elected.

Machine Tool Orders Best in Five Months

Reaching 35.1 per cent, based on 1926 volume of shipments, machine tool orders during October rose to a higher level than any month since last May, according to the monthly report of the industry's Supervisory Agency. This represents an advance of nearly 20 per cent from the preceding month when the volume was 29.4 and indicates the possibility that an upturn has been established which will carry through the winter. While the increase was largely due to domestic business, foreign orders rose sufficiently to maintain the 19 per cent of the total reported for September.

As shown by Table II, the larger companies, included in Group A, have done better than the smaller ones. Concerns in Group A exceeded the volume of last May, while those in Group B fell considerably short of it. In fact, orders received by the smaller companies have diminished for the last three months.

The distribution of orders in the industry, as shown in Table III, improved somewhat in October, but for the industry as a whole, is not as good as it was last Spring. For instance, during October 40 per cent of the total companies reporting showed a volume of business of less than 20 per cent of the 1926 shipments. Last May, when the index of gross orders was approximately at the same level, only 32.5 per cent of the companies were in this lower group.

The National Recovery Administration's publication, *The Blue Eagle*, of November 5, carried a chart comparing the index of machine tool orders with employment indexes, compiled by the

Table I—Index of Orders, Based on Volume of Shipments for 1926

Month	Index of Orders			3 Months' Average Index	% Foreign to Total Orders
	Domestic	Foreign	Total		
January	43.9	9.8	53.7	56.5	18
February	40.5	10.4	50.9	58.2	20
March	40.1	8.0	48.1	50.9	17
April	36.2	10.3	46.5	48.5	22
May	35.4	10.5	45.9	46.8	23
June	27.4	7.9	35.3	42.6	22
July	26.3	8.4	34.7	38.6	24
August	32.4	9.0	41.4	37.1	21
September	29.4	6.8	36.2	37.4	19
October	35.1	8.8	43.9	40.5	19

Note:—The figures in Table II are not directly comparable from month to month due to the varying number of reports. For indication of trend, refer to Table I, giving the Index Numbers for the Industry, and Table IV, giving Index Numbers by size of companies.

Table II—By Size of Companies

Group A—Companies reporting year's sales in 1926 of $200,000 or more:

Month	Index of Orders			No. of Reports	% Foreign to Total Orders
	Domestic	Foreign	Total		
January	43.5	10.5	54.0	82	19
February	39.5	11.2	50.7	82	22
March	38.8	8.4	47.2	82	18
April	35.3	10.9	46.2	89	24
May	34.6	11.2	45.8	88	25
June	26.8	8.3	35.1	90	24
July	25.8	8.9	34.7	90	26
August	31.4	9.6	41.0	93	23
September	28.7	7.1	35.8	94	20
October	34.9	9.4	44.3	96	21
Group B—Companies reporting year's sales in 1926 of less than $200,000.					
January	48.3	1.5	49.8	81	3
February	50.6	2.4	53.0	81	5
March	54.7	2.6	57.3	81	5
April	48.2	2.1	50.3	74	4
May	46.4	1.6	48.0	72	3
June	33.9	3.5	37.4	76	9
July	33.3	1.9	35.2	82	5
August	44.7	1.0	45.7	76	2
September	39.4	3.1	42.5	81	7
October	37.5	1.7	39.2	82	4

Table III—Distribution of Orders

(Shown by indexes of individua lcompanies)

New Orders in % of 1926 Shipments	Number of Reports in Each Index Group									
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.
200 or more	7	4	4	6	4	2	3	6	3	5
100–199	14	16	17	15	12	19	9	8	12	15
90–99	8	4	5	4	4	0	2	5	2	3
80–89	7	5	6	3	5	8	3	7	5	3
70–79	4	4	7	2	6	5	2	3	6	6
60–69	5	6	12	5	11	10	12	9	2	9
50–59	5	13	6	19	12	7	8	12	9	12
40–49	20	14	9	19	10	9	13	14	15	8
30–39	14	14	19	17	22	24	22	18	16	19
20–29	22	20	27	20	22	25	29	23	24	26
10–19	27	25	23	22	33	21	26	27	29	31
Less than 10	30	38	28	31	19	45	43	37	52	41
Total reports	163	163	163	163	160	166	172	169	175	178

Bureau of Labor Statistics and adjusted by NRA to conform to 1933 totals recently released by the Bureau of Census. The chart here shown by permission of the Division of Research and Planning compares the index of employment and indexes of man-hours and payrolls against the index of orders. All are adjusted to the average experience during 1929 as 100 per cent.

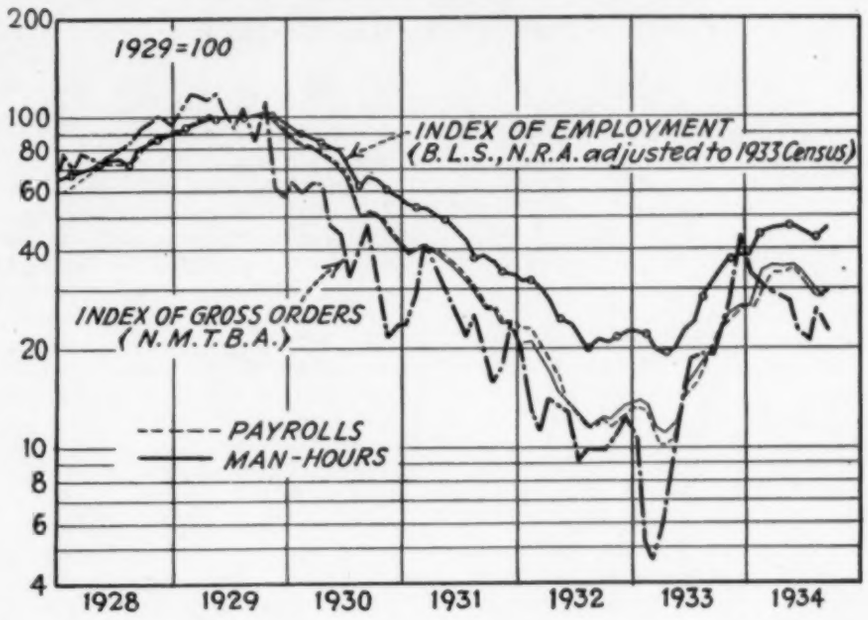
In the analyses, made by the Research and Planning Division, it is pointed out that the September employment was 45.2 per cent of the 1929 average and more than double the 1933 low of 19.5 per cent; also that employment was higher in September than for any corresponding month since 1930. Attention may be called also to the tendency of the employment index to lag behind the trend of orders for one to three months on the downswing, but to come right along with new orders when business returns. This is partly due to the lag of shipments following upon orders, since machine tool orders are customarily booked for one to three months delivery. There will be closer timing on the down-swing with shipments figures, if they were available, than with orders.

Also, part of the lag of the employment curve on the down-swing was caused by anxiety on the part of machine tool builders to hold their men as long as there was promise of employment for them. The custom of dividing work when there is not enough to occupy the shop's full time is reflected in the trend between the index of man-hours and the index of employment on the chart. The moment machine tool orders improved, however, employment man-hours and average weekly earnings all responded with an upturn at about the same rate.

Auto Engineers to Discuss Engine Wear

Wear factors in engine design and operation will be discussed in a two-day program sponsored by the Tractor and Industrial Power Equipment Committee, The Society of Automotive Engineers, on December 5 and 6 at the Stevens Hotel, Chicago. Among the engine components to be treated from this point of view are: cylinders, pistons, air-cleaners and valves and valve-gears. One of the four sessions will cover the influence of lubrication on the problem of engine wear, particularly in cold starting. Another will be devoted to diesel engines. The meeting will follow a two-day meeting of the Power and Machinery Division, the American Society of Agricultural Engineers.

Index of Orders and Employment Trends



• INDUSTRIAL REVIEW •

• Improvement in orders, as well as in business sentiment, is reported from practically all of the important industrial centers. Business men generally seem to feel that the thing to do is to work along with the Democratic Administration, take its protestations of a desire to be helpful at their face value, and do everything possible to get some business. The machine tool trade is naturally keenly interested in every organized effort to stimulate recovery in the durable goods industries because the purchase of production equipment is an inseparable part of any such program. More lists are out or in process of being made up than have been under consideration for a long time.

• All of the Eastern distributing centers report orders and inquiries, and the feeling is that November business will be well ahead of October. In northern New York sentiment is distinctly better although more business is being done in used machine tools than in new ones. Pittsburgh likewise reports a better feeling but a scarcity of actual orders. In Cleveland, however, there has been real improvement. Orders are improving slowly but steadily and the outlook is for a more rapid advance in December and January.

• Tool and pattern shops are busier in Detroit and supply business is brisker. Most of the machine tools ordered have been more or less special. Toledo reports more activity in used machinery sales but a reluctance on the part of executives to authorize expenditures for new equipment. Indianapolis is looking for a steady improvement in business although orders and inquiries cannot be called better than fair. Spottiness prevails in Cincinnati. Some companies are getting a few orders, others hardly any.

• St. Louis reports more optimism generally, but few orders for machines and little expectation of much improvement this year. A good volume of live interest exists in Chicago and distributors are feeling decidedly better. Some of them have booked encouraging orders. Prospects are good. Milwaukee reports little change, one way or the other, but looks for more activity as the various business and industrial recovery drives gather momentum.

• Word from San Francisco is to the effect that the election cleared the air considerably but that machine tool business is still quiet. From Seattle, however, comes word that the machine tool trade seems to be definitely on the increase.

Great Britain Doubles Her Imports of American Machinery

MANCHESTER—Considered as a unit the industrial machinery manufacturing industry is among those which continue to show the greatest improvement, although in certain sections little progress is being made towards recovery, according to Wallace E. Moessner, American vice-consul. Production in general has been speeded up and there has been, during the past year, a very substantial increase in the number of persons regularly employed. Increased exports, amounting to some 20 per cent as compared with a year ago, have contributed very materially to the general recovery of the industry.

Perhaps the most active demand was for various types of machine tools, particularly those for precision grinding and gear cutting. There was also a good demand throughout the quarter for mining machinery and pumping equipment, while the electrical section continued to be well employed. Some important orders for locomotives were placed during the quarter and internal combustion engines were in demand.

The total exports of machinery and parts increased from 71,374 tons (2,240 lb.) valued at £6,654,903, during the third quarter of 1933, to 82,077 tons valued at £8,017,224 for the quarter ended September 30, 1934, or about 15 per cent by volume, and 20 per cent in value. As compared with the second quarter of this year, there was also a substantial increase in volume, but a slight decrease in value, the figures for this period being 81,702 tons valued at £8,206,226.

During the first nine months of 1934 the total exports of all classes of machinery and parts amounted to 239,326 tons valued at £23,354,136 as compared with 199,652 tons valued at £19,867,941 during the corresponding period of 1933.

The total British imports of industrial machinery during the quarter under review amounted to 18,205 tons valued at £2,921,615, as compared with 11,428 tons, valued at £2,064,184 for the corresponding period of 1933, or increases of 60 per cent in volume and nearly 42 per cent in value. For the first nine months of 1934, such imports amounted to 48,884 tons, valued at £8,463,935, as compared with only 31,515 tons, valued at £6,176,881 for the nine months ended September 30, 1933. For the same periods the share of the United States increased from 8,426 tons, valued at £2,448,991 to 16,006 tons valued at £3,732,717, and that of Germany from 10,429 tons, valued at £1,859,368, to 15,135 tons valued at £2,432,754. Among the various classes of machinery the more important increases were in imports of machine tools, refrigeration machinery, sewing machines, hosiery and knitting machinery, air and gas compressors, and agricultural machinery.

Social Legislation Defined By President

WASHINGTON—With the present administration seated firmly in the saddle for at least another two years, industrialists are awaiting its effect on the trend of national affairs. Only the most conservative could object to the President's speech before the National Conference on Economic Security in which he indicated that social legislation would be approached carefully and in line with the Rooseveltian policy of putting "first things first." While the common interpretation that he proscribed all social legislation but unemployment insurance may not hold, it is reassuring to hear that any move in this direction will be on an actuarial basis, contributory in form and divorced from emergency and other relief measures. If the President has his way, job insurance will really be insurance and avoid the "dole" features that have been the bane of European systems. It seems definite that any plan, to meet Executive approval, will not apply to those now out of work but must be insurance against loss of income that will be graduated with consideration of the pay received when employed.

No great changes in relief policies are coming this winter according to Harry Hopkins, FERA administrator. While officials of FERA and its local organizations prefer taking men off direct relief and placing them on work relief there will be no great swing to the latter practice because of its higher cost. At present there are 4,000,000 families and 500,000 single people on direct relief and 1,800,000 on work relief.

A ghost of the New Deal which stubbornly refuses to be laid is the theory that business and employment can be speeded by full operation of all factories at full blast with the resultant output to be taken care of through some scheme of federal assistance. However, some of the most influential among high administrative officials are flatly opposed to the scheme.

Initial ownership of the idea is vague. In its various forms it has been discussed by NRA statisticians and toyed with by some planners in the Department of Agriculture. Certain ramifications were given private study, although later dropped, by the Treasury Department.

Eight-Day Fair to Show Cleveland's Recovery Progress

Backed by 200 civic leaders and all important organizations in the city, Cleveland is to have a trade and industrial fair that will fill the 260,000 sq.ft. of exhibition space in the Public Auditorium. Running for eight days, Dec. 29 to Jan. 5, the show will have a background of spectacular entertainment. Lighting effects will play a dominant part in the decoration, the designs using the more successful ideas exploited at the Chicago World's Fair. According to Lincoln G. Dickey, managing director, the federal better housing campaign, the electrical industry of Cleveland will offer displays featuring processes of manufacture of its product.

Jesse Jones Urges More Industrial Loans

Jesse H. Jones, chairman, the Reconstruction Finance Corporation, has advised industry that industrial concerns eligible to borrow funds for maintaining

Metal-Working Code Hearings Scheduled

Date	Place	Deputy Administrator	Association
Nov. 23	Commerce Bldg.	B. S. King	Air Valve (Amendment)
Nov. 27	Willard Hotel	N. W. Foster	Machinery & Allied Products Institute (Amendment)
Nov. 27	Willard Hotel	N. W. Foster	Mechanical Scale Removing (Proposed sub-division of MAPI)
Nov. 27	Washington Hotel	D. A. Tutein	Radio Transmitting & Public Address Apparatus & Commercial Radio Receiver (Sub-division of NEMA)
Dec. 4	Mayflower Hotel	Schurz	Allied Mfrs. of the Beauty and Barber Industry (Amendment)

and increasing employment have not taken full advantage of the corporation's assistance. Many concerns are in involved and weakened positions, but the corporation believes that where present creditors are willing to cooperate in a proper adjustment of the existing debt structure, many such enterprises may safely be supplied with funds that will enable continuing operations on a sound basis. Where credit is not available to such concerns at prevailing bank rates, because adequate security can be offered but is frozen, the enterprises may apply to their local office of the R.F.C.

Power Show Will Feature Cost-Saving Equipment

The eleventh National Exposition of Power and Mechanical Engineering will be held at the Grand Central Palace, New York, from December 3 to 8. The national trend toward cutting power service costs is reflected in the exhibit plans. Air conditioning and refrigerating equipment will be augmented by a complete display of industrial fans and blowers. Refractory and insulation products will cover requirements in every variety of industrial furnace equipment. Operating exhibits will show production and properties of high-strength and heat-resisting castings. Additional savings of 15 to 40 per cent from proper installation and insulation of underground steam lines will be stressed by manufacturers of conduit materials, accessories and insulation. Besides the power generation equipment there will be a section on the specialties and accessories which affect incidental savings in power plants.

• EXPORT • OPPORTUNITIES

Arthur Savage, the Compania Frutera Peruana, Sociedad Anonima, Lima, Peru, wants to get in touch with manufacturers of machinery for the extraction of jute fiber and for the manufacture of jute sacks.

Felton & Orr, 306-310 Queen's Arcade, Customs St., East, Auckland, C. I., New Zealand, are inquiring for one and for three staple-making machines, each machine to produce 15 tons in 44 hours, and to handle wire from Nos. 8 to 12 gage. The staples have a barb on the outside of each leg.

Rost & Janus, Succs., 70, Rua Passos Manoel, Porto, Portugal, are interested in machinery for production of rubber belting about 3 in. wide.

D. Ouzounian, M. Soultanian & Co., P. O. Box 127, Nicosia (Cyprus), wish to get in touch with manufacturers of machinery for making furniture.

Dr. L. Adlerstein & Co., P. O. Box 905, Tel-Aviv, Palestine, are interested in machinery for making bottle caps.

• PERSONALS •

ARNOLD LENZ, assistant manufacturing manager of the Chevrolet Motor Co., was awarded the John Hill Whiting gold medal for notable contributions to the foundry industry at the recent annual meeting of the American Foundrymen's Association and the Fifth International Foundry Congress, in Philadelphia. THOMAS S. HAMMOND, chairman of the Board of Awards, said: "It is a privilege to present the John Hill Whiting medal to a rugged individual of the type that has made industry in this country great."

WALTER ELLIOTT, chief engineer and supervisor of the Sheet Metal & Stamping Division of the Stevens Walden, Inc., of Worcester, Mass., has resigned to become engineer in charge of manufacturing for the Whitney Manufacturing Co., Hartford, Conn.

E. A. FORSBERG, of the Aktiebolaget Separator Styrelsen, Stockholm, Sweden, one of the best known experts on metal cutting in Europe is visiting American plants.

O. R. HOLLSTROM has been elected president of the Corry-Jamestown Mfg. Corp., manufacturer of metal equipment, Corry, Pa.

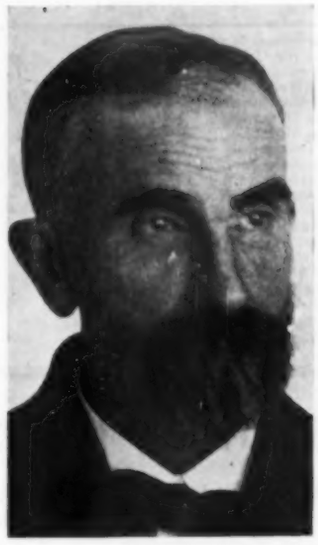
CHARLES B. LANSING, president of the National Tile Co., Anderson, Ind., has been elected general manager of the Ferry Cap & Set Screw Co., Cleveland. Present officers and the directorate continue without change.

THOMAS E. LORD of Detroit has been appointed engineer for the National Tool Co., Cleveland, and will work direct from the home office.

WHITLEY B. MOORE has been appointed general manager of the Industrial Division, the Timken Roller Bearing Company. He has been sales manager since 1930. JOHN L. YOUNG, until recently district general manager in charge of the Pittsburgh office, has been advanced to the position of assistant general manager of the Industrial Division and will move to Canton, Ohio.

EDWARD NAGEL, formerly with the Chicago Pneumatic Tool Co., for 20 years, has taken charge of the manufacturing of parts and the rebuilding of pneumatic tools for the Master Tool Co., Inc., Cleveland, Ohio.

• OBITUARIES •



ROGER M. CLOUGH, inventor and manufacturer of the Clough gear and milling cutters, adjustable counterbores, reamers, vertical and bench milling machines, deep-throat shears and punch presses, died at Meriden, Conn., on November 9. His oldest son, ARTHUR W. CLOUGH, who has been associated with his father will continue the business.

ALBERT E. DOMAN, 64, one of the founders of the Owen Dyneto Corp., Syracuse, N. Y., died Nov. 12. The firm was taken over by the Electric Auto-Lite Co. several months ago.

GEORGE W. DRAKE, mechanical engineere for the Warner & Swasey Co., died November 8. For 40 years he has been associated with Warner & Swasey, first as draftsman, then as machine designer, and finally as mechanical engineer. A number of patents are credited to his name.

ROBERT A. HOCK, 44, treasurer of the Columbia Axle Co., Cleveland, Ohio, for the past 3½ years and prior to that time treasurer of the Salisbury Axle Co., Jamestown, N. Y., died November 10.

ROBERT A. GAMBLE, 62, expert on Colt's guns, died recently. Previous to the war he joined the Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., and was gun expert for that company until his death.

GEORGE D. OLDHAM, 62, master mechanic of the Ashtabula Great Lakes Engineering Works, Ashtabula, Ohio, for the past 17 years, died November 12.

FRANKLIN SCHNEIDER, 73, one of the founders of the Van Dorn Electric Tool Co., Cleveland, Ohio, and president of that concern until his retirement several years ago, died recently.

Corporation Reports

Company	1934 Earnings Nine Months	1934 Earnings Third Column	1933 Earnings Nine Months	1933 Earnings Third Column
Addressograph-Multigraph	$333,160	$25,765	d$115,771	d$20,869
Alemite Die-Casting & Mfg	d445,542	.....	.....	.....
Bendix Aviation	1,742,439	.....	1,096,367	.....
Curtiss-Wright	584,829	490,521	582,450	154,376
Compo Shoe Machinery	204,003	66,041	191,030	66,926
Hudson Motor Car	d1,563,144	d944,984	d1,307,422	19,043
General Motors	92,537,898	22,902,441	81,493,491	33,376,089
Mack Trucks, Inc	167,251	d13,729	d567,211	d85,101
Mergenthaler Linotype	*212,027	.....	d959,253	.....
Packard Motor Co	d5,348,409	d2,389,265	d487,084	622,786
Pittsburgh Screw & Bolt	335,892	7,022	d183,297	110,611
Reo Motor Car	d907,483	d400,539	d1,078,593	d315,649
Reynolds Spring	195,987	.....	101,720	.....
Studebaker	.....	d369,327	.....	32,306
Trico Products	1,453,235	367,325	929,899	391,125
United American Bosch	137,489	6,164	41,079	75,994
Westinghouse Electric & Mfg	d363,787	d332,062	d7,083,641	d1,513,645
Wright Aeronautical	838,251	436,958	508,418	77,936

d—Deficit.
*—Year ended September 30.

• BUSINESS ITEMS •

The Link-Belt Co., Chicago, has purchased the physical assets of the Bailey-Burruss Manufacturing Co., 1116 Murphy Ave., Atlanta, Ga., and its Atlanta sales office will be moved to that plant. The combined operations will be headed by I. H. BARBEE. who is being transferred from the Philadelphia plant.

The Dollin Corp., 300 Communipaw Ave., Jersey City, N. J., has been organized by EDGAR N. DOLIN, former president of the Allied and Acme Die Casting Corp., to take over the die-casting division of the American Type Founders Co., and also the die-casting division of the Lionel Corp.

The Societe Genevoise D'Instruments de Physique, Geneva, Switzerland, manufacturers of the line of Swiss jig boring machines and high precision equipment, has appointed the Triplex Machine Tool Corp., 125 Barclay St., New York, N. Y., as agents for its line in the United States and Canada. The line was handled for many years by the R. Y. Ferner Co., Washington, D. C., but since the recent death of R. Y. FERNER, the above change has been made.

The Blackman-Hill & Co., machine tool dealers at St. Louis, Mo., have changed their name to Blackman & Neutzel Machinery Co.

The Pennsylvania-Conley Tank Car Co., Pittsburgh, Pa., has purchased the assets and equipment of the Oil City Tank Car Co., Oil City, Pa., according to an announcement by WALTER G. CURLEY, president of the former concern. The Oil City plant will be continued in operation with HARRY PEARSON as general manager.

The Ex-Cell-O Aircraft & Tool Corp., Detroit, has appointed SIDNEY LANGSTON, Penton Bldg., Cleveland, as representative for its complete line of products in that territory.

The Trojan Composition Co., manufacturer of oil cups and packing, has removed its business and equipment from Havre de Grace, Md., to Williamsport, Pa., where a modern industrial building has been acquired. W. M. CLANCY is president and RICHARD W. SCOTT is vice-president and treasurer.

Rosenkranz & Weisbecker, 149 Broadway, New York, N. Y., has been organized to deal in new, used and rebuilt machinery and liquidation of surplus equipment both for the domestic and export trade. HENRY J. ROSENKRANZ, formerly vice-president of Morey Co., and ALFRED J. WEISBECKER, formerly New York sales manager of Simmons Machine Tool Corp., formed the partnership.

The district office of the development and research department, International Nickel Co., Inc., moved on November 1 to larger quarters in the General Motors Bldg., Detroit.

• MEETINGS •

AMERICAN ENGINEERING COUNCIL. Annual meeting, Jan. 10-12. Washington, D. C. FREDERICK M. FEIKER, executive secretary, 744 Jackson Place, N. W., Washington, D. C.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Annual meeting, Dec. 4-6, at the headquarters of the society, Engineering Societies Bldg., 29 West 39th St., New York, N. Y.

NATIONAL ASSN. OF BOTTLING MACHINERY MANUFACTURERS. Annual meeting, Jan. 14. Hotel Statler, Buffalo, LOUIS B. MONTFORT, secretary, 218 Munsey Bldg., Washington, D. C.

NATIONAL ASSOCIATION OF MANUFACTURERS. Annual meeting, Dec. 5-6. Waldorf-Astoria Hotel, New York. WALTER B. WEISENBURGER, executive vice-president, 11 West 42nd St., New York, N. Y.

POWER SHOW. Eleventh national exposition of power and mechanical engineering. Dec. 3-8. Grand Central Palace, New York. CHARLES F. ROTH, manager, Grand Central Palace.

SOCIETY OF AUTOMOTIVE ENGINEERS. Tractor and industrial power equipment meeting, Dec. 5-6. Stevens Hotel, Chicago. Thirtieth anniversary dinner, Jan. 7. Hotel Commodore, New York. Annual meeting, Jan. 14-18. Book-Cadillac Hotel, Detroit. JOHN A. C. WARNER, secretary, 29 West 39th St., New York.

• PATENTS •

October 30, 1934

Metal-Working Machinery

Grinding Machine. Herbert W. Johnson, Chicago, Ill., assigned to American Coil Spring Co. Patent 1,978,674.

Machine for Sawing Nuts and the Like. Oran A. Milam and Robert E. Milam, Brownwood, Tex., assigned to Douglas Coalson. Patent 1,978,808.

Wheel Truing Machine. Edward W. Miller, Springfield, Vt., assigned to the Fellows Gear Shaper Co. Patent 1,978,845.

Drilling Machine. Walter Ferris and Ernest Wiedman, Milwaukee, Wis. and Donald Clute, Detroit, Mich., assigned to the Oilgear Co. Patent 1,978,879.

Method of and Means for Cutting Gears. Ernest Wildhaber, Brooklyn, N. Y. Patent 1,978,924.

Cutting-Off Machine. Ledgeworth G. Casey, Cincinnati, Ohio, assigned to the Cincinnati Electrical Tool Co. Patent 1,979,140.

Grinding Wheel Spindle. Peter Davey, Mount Vernon, N. Y. Patent 1,979,146.

Tools and Attachments

Combined Circular Chaser and Turning Tool. William J. Hogg, Cleveland, Ohio, assigned to the National Acme Co. Patent 1,978,427.

Grinder for Cylindrical Surfaces. Marsden C. Hutto, Detroit, Mich., assigned to Hutto Engineering Co., Inc. Patent 1,978,428.

Broaching Fixture. Carl J. Halborg, Detroit, Mich., assigned to Colonial Broach Co. Patent 1,978,458.

Lathe Chuck. Oliver Styles, Santiago, Chile. Patent 1,978,611.

Gauge for Chaser Grinding. Ernest T. Bysshe and Robert R. Finn, Springfield, Vt., assigned to Jones & Lamson Machine Co. Patent 1,979,023.

Screw Threading Die. Ernest T. Bysshe and Robert R. Finn, Springfield, Vt., assigned to Jones & Lamson Machine Co. Patent 1,979,024.

November 6, 1934

Metal-Working Machinery

Grinding and Polishing Apparatus. Herman Goldberg, Chicago, Ill.

Work Holding and Feeding Mechanism. Frank L. Cone, Windsor, Vt. Patent 1,979,366.

Work Holding Mechanism. Frank L. Cone, Windsor, Vt. Patent 1,979,367.

Headstock for Lathes. Constant Bouillon, Torrington, Conn., assigned to the Hendey Machine Co. Patent 1,979,443.

Stroke Adjusting Device for Power Hammers. Mark H. Damerell, Worcester, Mass., assigned to Wyman-Gordon Co. Patent 1,979,733.

Knife Grinder. Frederick W. Seybold, Dayton, Ohio, assigned to Harris, Seybold, Potter Co. Patent 1,979,775.

Machine for Rolling Screw Threads. Glenn H. Wayne, Waterbury, Conn., assigned to Scovill Manufacturing Co. Patent 1,979,919.

Swaging Hammer. Hans Beche, Huckeswagen, Germany. Patent 1,979,931.

Tools and Attachments

Radius Turning Tool. Harry J. Chedester, United States Navy. Patent 1,979,252.

American Machinist

REFERENCE BOOK SHEET

©

Trade Designations of Magnesium Alloys

Abstracted from "Service Characteristics of the Light Metals and Their Alloys," published by the American Society for Testing Materials.

TRADE DESIGNATIONS OF MAGNESIUM ALLOYS, CAST AND WROUGHT.

Item	A.S.T.M.	U. S. Army	U. S. Navy	Dow Chemical Co. (Dowmetal)	American Magnesium Corp.	Bohn Aluminum and Brass Corp. (Bohnalite)
No. 0	*	57-21		Magnesium		
No. 1	Alloy 1[b]	57-74-lb grade 1	M-112c alloy 1	A	AM241	X-3
No. 2	Alloy 2[b]	57-74-lb grade 2	M-112c alloy 2	G	AM240	X-2
No. 3	Alloy 3[b]	.....	M-112c alloy 3	B	AM246	X-7
No. 4	Alloy 4[b]	.....	M-112c alloy 4	H	AM265	X-4
No. 5	Alloy 5[b]	.....	M-112c alloy 5	F	AM233	X-1a
No. 6	Alloy 6[b,d]	.....	M-111b alloy 1			
No. 7	Alloy 7[d]	.....	M-129a	E	AM575	X-3a
No. 8	Alloy 8[d]	.....	M-129a grade 2		AM565	.....
No. 9	Alloy 9[d]	.....	M-129a grade 3		AM515	X-11a
No. 10	Alloy 10[d]	.....	M-111b alloy 2	M	AM35	.....
No. 11	Alloy 11[e]	.....	M-111b alloy 3			.....

[a] Tentative Specifications for Magnesium Ingot and Stick for Remelting (B 92 – 33 T), *Proceedings*, Am. Soc. Testing Mats., Vol. 33, Part I, p. 636 (1933); also 1933 Book of A.S.T.M. Tentative Standards, p. 332.
[b] Tentative Specifications for Magnesium-Base Alloy Sand Castings (B 80 – 34 T), *Proceedings*, Am. Soc. Testing Mats., Vol. 34, Part I (1934); also 1934 Book of A.S.T.M. Tentative Standards.
[c] Tentative Specifications for Magnesium-Base Alloy Sheet (B 90 – 34 T), *Proceedings*, Am. Soc. Testing Mats., Vol. 34, Part I (1934); also 1934 Book of A.S.T.M. Tentative Standards.
[d] Tentative Specifications for Magnesium-Base Alloy Forgings (B 91 – 34 T), *Proceedings*, Am. Soc. Testing Mats., Vol. 34, Part I (1934); also 1934 Book of A.S.T.M. Tentative Standards.

NOMINAL COMPOSITION OF MAGNESIUM ALLOYS, CAST AND WROUGHT.[a]

Item	Aluminum, per cent	Manganese, per cent	Zinc, per cent	Copper, per cent	Cadmium, per cent	Tin, per cent
			99.9 per cent magnesium			
No. 0	8.0	0.2	.....	.....	.....	.....
No. 1	10.0	0.1	.....	.....	.....	.....
No. 2	12.0	0.1	.....	.....	.....	.....
No. 3	6.0	0.2	3.0	4.0	2.0	.....
No. 4	2.0	0.3	.....	.....	.....	.....
No. 5	4.0	0.3	.....	.....	.....	.....
No. 6	6.0	0.3	.....	.....	.....	.....
No. 7	8.5	0.2	0.75	.....	.....	.....
No. 8	8.5	0.2	0.5	.....	.....	.....
No. 9	.....	1.0	.....	.....	.....	6.0
No. 10	.....	1.5	.....	.....	.....	.....
No. 11	.....	.....	.....	.....	.....	.....

[a] Aluminum content = remainder.

TYPICAL MECHANICAL PROPERTIES OF MAGNESIUM ALLOYS, CAST AND WROUGHT.

Modulus of elasticity is 6,500,000 lb. per sq. in.

Item	Condition[a]	Tensile Strength, lb. per sq. in.[b]	Yield Strength (Set = 0.2 per cent), lb. per sq. in.[c]	Elongation in 2 in., per cent	Brinell Hardness Number[d]	Rockwell Hardness Number, "E" Scale	Compressive Strength, lb. per sq. in.	Shearing Strength, lb. per sq. in.	Charpy Impact, ft-lb.	Endurance Limit, lb. per sq. in.[e]
No. 1	Sand cast	25 000	11 000	4	45	35	46 000	17 000	0.9	7 000
	Sand cast H. T. 1	33 000	11 000	9	48	55	46 000	17 000	2.2	7 500
No. 2	Die cast	29 000	20 000	1	63	75	.....	.....	.....	.....
	Sand cast H. T. 1	33 000	12 000	7	51	61	51 000	20 000	2.0	11 000
	Sand cast H. T. 2	33 000	16 000	3	60	73	51 000	21 000	1.0	10 000
	Sand cast H. T. 3	33 000	19 000	1	69	80	55 000	22 000	0.7	10 500
No. 3	Sand cast	29 000	21 000	0.5	75	84	55 000	18 000	.....	7 000[f]
No. 4	Sand cast	25 000	11 000	6	48	55	46 000	19 000	1.0	6 000
No. 5	Sand cast	24 000	8 000	6	44	54	39 000	15 000	2.2	13 000
No. 6	Extruded/ Forged	40 000	26 000	15	85	95	58 000	20 000	2.2	13 000
	Forged	38 000	23 000	12	80	90	.....	.....	.....	12 000
	Sand	25 000	9 000	4	45	55	.....	.....	.....	.....
	Sheet annealed	33 000	19 000	14	55	66	.....	.....	.....	.....
No. 7	Extruded/ Forged	38 000	25 000	12	63	74	61 000	21 000	.....	10 000
	Extruded/ Forged	43 000	28 000	13	85	92	64 000	23 000	2.0	12 000
No. 8	Forged	42 000	28 000	9	89	96	64 000	23 000	2.2	16 000
	Forged	45 000	32 000	6	72	83	60 000	23 000	1.4	10 000
No. 9	Forged	35 000	19 000	5	45	49	57 000	19 000	2.0	9 000
No. 10	Extruded/ Sheet	42 000	26 000	7	49	49	.....	.....	.....	7 000
No. 11	Extruded	38 000	21 000	6	58	60	.....	.....	.....	.....

[a] H. T. 1 = Solution heat treatment.
H. T. 2 = Solution heat treatment + partial aging.
H. T. 3 = Solution heat treatment + complete aging.
[b] Tensile specimens are according to A.S.T.M. Tentative Specifications for Magnesium-Base Alloy Sand Castings (B 80 – 34 T); for Magnesium-Base Alloy Sheet (B 90 – 34 T); for Magnesium-Base Alloy Forgings (B 91 – 34 T); and for Magnesium-Base Alloy Stock for Remelting (B 92 – 33 T), *Proceedings*, Am. Soc. Testing Mats., Vol. 34, Part I (1934); also 1934 Book of A.S.T.M. Tentative Standards.
[c] Yield strength is defined as the stress at which the stress-strain curve deviates 0.2 per cent from the modulus line.
[d] Brinell hardness is obtained with 500-kg. load, 10-mm. ball.
[e] R. R. Moore type rotating-beam machine—500 million cycles.
[f] Properties of extruded material for round and square up to 1¼ in.
[g] Approximate value.

PHYSICAL PROPERTIES OF MAGNESIUM ALLOYS.

Item	Condition[a]	Specific Gravity	Weight, lb. per cu. in.	Melting Range deg. Fahr.	Melting Range deg. Cent.	Coefficient of Thermal Expansion, 68 to 750 F.	Thermal Conductivity, c.g.s. units, 100 to 300 C.	Electrical Resistivity, microhms per cu. cm. at 20 C. (68 F.)
No. 1	Sand cast	1.80	0.065	1120–815	605–435	0.000016	0.18	13.0
	Sand cast H. T. 1	1.80	0.065	1120–815	605–435	0.000016	.....	15.0
No. 2	Sand cast	1.81	0.066	1100–815	595–435	0.000016	0.17	15.0
	Sand cast H. T. 1	1.81	0.066	1100–815	595–435	0.000016	.....	17.5
	Sand cast H. T. 2	1.81	0.066	1100–815	595–435	0.000016	.....	16.0
	Sand cast H. T. 3	1.81	0.066	1100–815	595–435	0.000016	.....	14.0
No. 3	Sand cast	1.82	0.066	1070–755	575–435	0.000016	0.16	14.0
No. 4	Sand cast	1.80	0.065	1120–815	605–435	0.000016	.....	.....
No. 5	Sand cast	1.84	0.067	1185–1050	640–565	0.000016	.....	6.5
No. 6	Extruded	1.77	0.064	1160–815	625–435	0.000016	0.30	10.0
No. 7	Extruded	1.79	0.064	1140–815	615–435	0.000016	0.30	9.0
No. 8	Extruded	1.81	0.065	1185–	625–	0.000016	0.30	13.0
No. 9	Forged	1.83	0.066	.....	.....	.....	.....	.....
No. 10	Forged	1.85	0.067	.....	.....	.....	.....	.....
No. 11	Extruded	1.76	0.064	1200	650	0.000016	0.30	5.0

[a] H. T. 1 = Solution heat treatment.
H. T. 2 = Solution heat treatment + partial aging.
H. T. 3 = Solution heat treatment + complete aging.

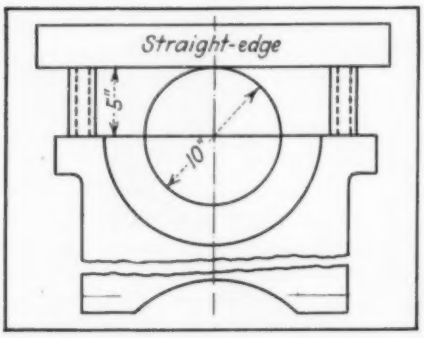
• IDEAS •
FROM PRACTICAL MEN

Centralizing Work With the Machine Spindle Discussion

DONALD RAEBURN
Glasgow, Scotland

In an article under the title given above (*AM*—Vol. 78, page 518), Charles Kugler describes two methods of setting work in correct relation to the center of the machine spindle. While these methods are admirable for the lighter class of machines and work, a different procedure is necessary if the work is to be done in a horizontal boring machine of the floor type.

Where the work to be bored is in two parts, as in pillow blocks and their caps, and where the joint faces have been machined, such heavy work must be mounted on the floor plate and the setting must be taken from the boring bar. The method is to set the joint face of the lower member parallel with the floor plate, using a dial indicator. Assuming that the boring bar is 10 in. in diameter and that it runs true, blocks 5 in. in height are placed on the joint face on each side of the bar. Then a straight-edge is placed across the bar, resting on the height blocks, as shown in the sketch.



Where heavy work is to be bored in a horizontal boring machine of the floor type, it can be centered with the machine spindle by the method described

The boring bar, which has been set below the center height of the hole to be bored, is raised until its upper surface contacts with the straight-edge. This contact can be tested with very thin tissue paper. The center of the bar is now at the same height as the joint face. The cap is secured in place, and when the hole is bored it will be central with the joint faces.

If the necessary height blocks are not at hand, they can be made by cutting off pieces of tubing and facing them to length.

A Light-Weight Vernier for Diemakers

WM. C. BETZ
Master Mechanic, Fafnir Bearing Company

In die and tool work there are many occasions where a light-weight vernier having small jaws would be of great advantage. Such a vernier is shown in the illustration.

The vernier scale *A;* the adjusting screw *B;* the clamp *C* and the scale or beam *D* are all parts of a standard vernier depth-gage and can be bought from the makers of such tools.

The stationary and the sliding heads are made in one piece and are then cut apart with a thin saw. The heads are then mounted, one at a time, on an angle plate on the faceplate of a bench lathe and the round jaws are turned to ⅞ in. in diameter, plus 0.008 in. for grinding. Both heads are then hardened.

For grinding the jaws, the tool is assembled with the jaws opened about ¾ in. and both heads are locked in the scale by the screws *F* and *H*. The assembled tool is clamped to a small angle plate mounted on the faceplate of an internal grinder with the round jaws projecting outward and with one edge of the sliding head resting against a parallel to bring the scale at a right angle to the machine spindle. After one jaw has been ground, the tool is shifted to bring the other jaw into grinding position.

After both round jaws have been ground, the assembly is clamped to an angle plate mounted on the table of an internal grinder with one edge of the sliding head resting against a parallel. The adjacent faces of the flat jaws are then ground in line with the inner edges of the round jaws, using a saucer wheel. The assembly is again mounted on the internal grinder as before, but with the flat jaws projecting outward and with their adjacent faces in contact. The outsides of the jaws are then ground to 0.250 in. in diameter.

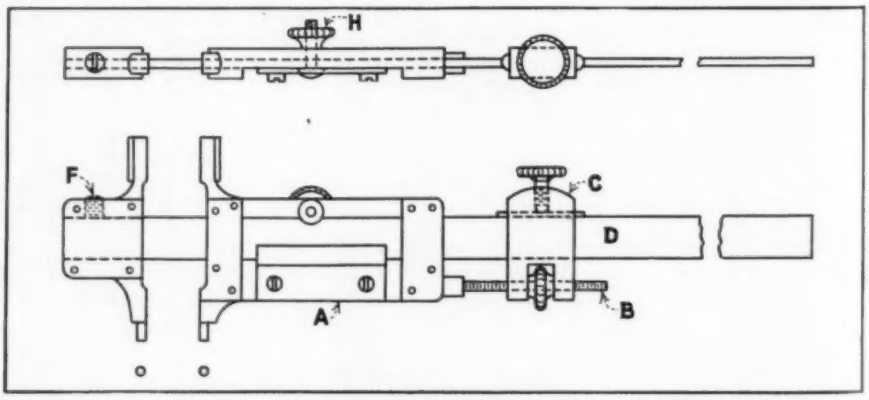
The vernier scale is adjusted to read 0.500 in. when the jaws are closed. For outside measurement with either jaws, 0.500 in. is to be deducted from the vernier reading to arrive at the actual size. For inside measurement with the flat jaws, 0.250 in. is to be deducted, and 0.375 in. is to be deducted from the reading when inside measurement is made with the round jaws.

A Quick-Acting Drill Jig

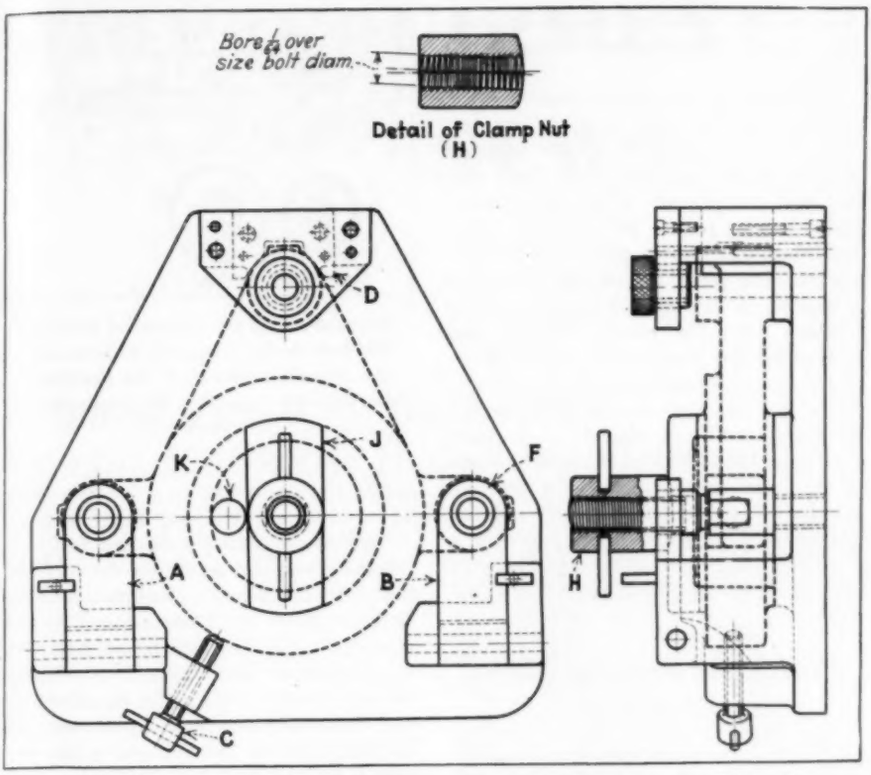
PHIL E. VERAA

The jig illustrated was designed for drilling three holes in the triangular piece indicated by heavy dotted lines. The hole at the top is cored and is drilled with a core drill, the other two holes being drilled in the solid metal.

Bushing plates *A* and *B* are pivoted so that they can be swung up so as to not interfere with placing the work in the jig. With the work in place, screw *C* forces the boss at the top into the



The scale, vernier scale, clamp, and adjusting screw are all parts of a standard vernier depth-gage and can be purchased from the makers of such tools



With the work placed in the jig, one boss is forced into a V-block and another into a pocket by screw *C*. Then it is clamped by a quick-acting nut of ingenious design

V-block *D* and the boss at the right into the pocket *F*. The bushing plates are then brought down and nut *H* is screwed down on the clamp *J*, which is prevented from turning with the nut by the pin *K* in the base.

After being tapped, the clamping nut *H* is rebored at a slight angle and slightly larger in diameter than that of the stud on which it fits, so that the threads are cut away on opposite sides at both top and bottom. Its seating face is also slightly rounded. By holding the nut at the angle at which it is rebored, it can be slipped over the stud and onto the clamp. Holding it upright and engaging its threads with those of the stud, it can be screwed down on the clamp. By slackening the nut and tipping it to the angle at which it is rebored, the threads are disengaged from those on the stud and it can be lifted off of the stud.

Improvised Notching Shear

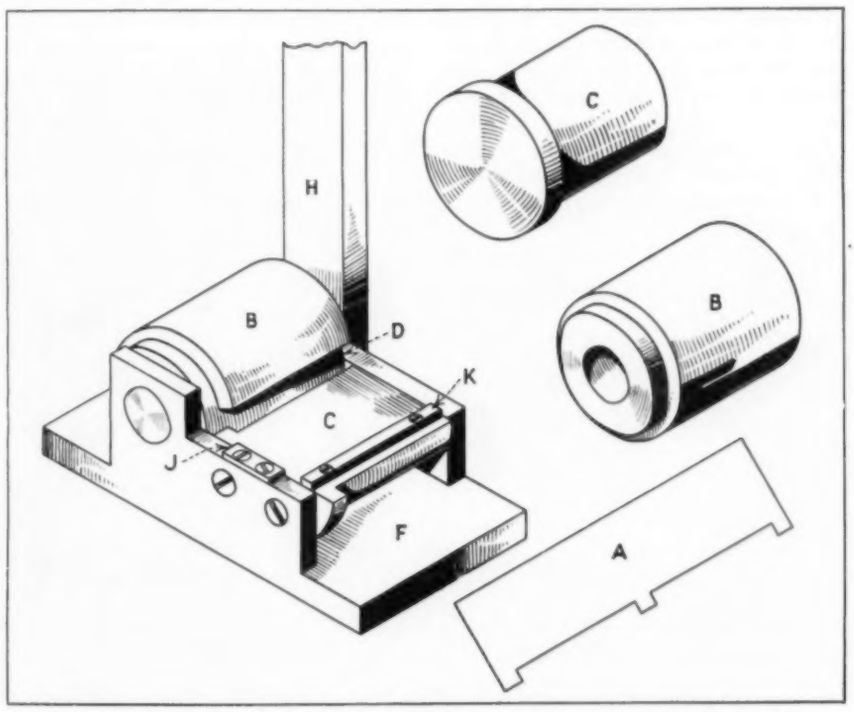
J. E. MOORE

We had several hundred strips of sheet zinc, 0.025 in. thick, to be notched as at *A*, leaving three small tongues. As both our equipment and material were limited, we had to be satisfied with making the workable hand shear illustrated.

Two pieces of soft steel were turned as at *B* and *C*. Piece *B* was drilled and fitted with a shaft held by a taper pin. It was also grooved lengthwise, as at *D*, the groove being ½ in. wide and of a depth that brought its bottom flush with the smaller diameter. Piece *C* was slabbed off to the center, one-half being cut away. Both pieces were then assembled to the piece of channel steel *F*, which was machined as shown. Lever *H* was then attached to the shaft, being counterweighted to hold it in an upright position. Stops *J* and *K*, attached as shown, completed the device.

With a strip of zinc laid on top of piece *C* and against stops *J* and *K*, pulling lever *H* rotated piece *B* and cut a notch in the strip. The strip was then turned end for end and the process was repeated for cutting the other notch.

The shear was made by the boys in one of the public schools at Wichita, Kan., in the machine shop attached to the school.



One notch is cut at a time. After the first one has been cut, the strip is turned end for end for cutting the other

Devices for Starting Axial Holes Centrally—Discussion

JAMES MCINTOSH

In an article under the title given above (*AM*—Vol. 78, page 681), Peter L. Budwitz describes devices for starting axial holes centrally.

Assuming that but one piece is to be drilled, no skilled lathe hand would consider using either of the two devices. If many pieces are to be drilled, the use of such a jig as described by F. Server (*AM*—Vol. 78, page 682) would be ideal, but jigs for this purpose generally

have cup centers at both top and bottom to locate the work.

In drilling axial holes in the lathe it is usual to center the drill in the work by holding the butt end of a tool against the drill, enough pressure being applied to prevent any tendency of the drill to wabble. This will center the drill point until the drill has penetrated far enough to be steadied in the hole. If the hole is to be sized by reaming, it is always good practice to use a boring tool to true and size the hole to center a second drill and the reamer without the application of any support or control to center the drill for a start.

Inexpensive Piercing Tools for Limited Production

G. H. DINGMAN

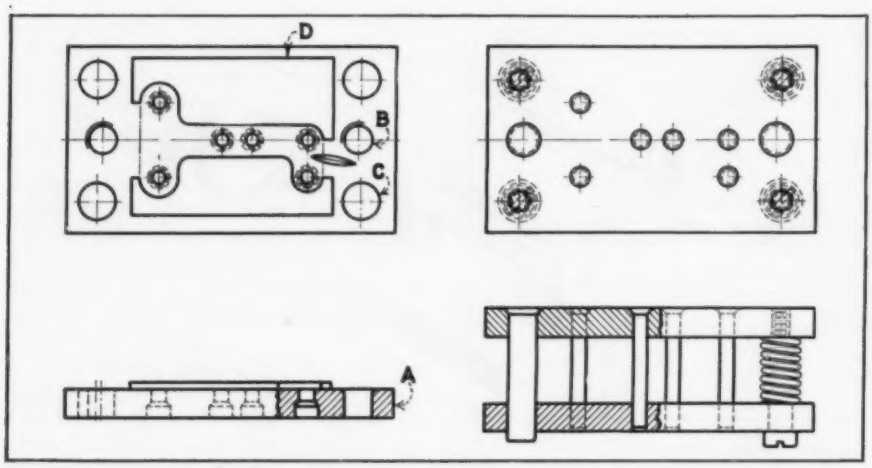
Low cost press tools for piercing a limited quantity of blanked parts are shown in the illustration. The die *A* is made from flat, ground tool steel $\frac{3}{8}$ in. thick, which can be bought from any mill supply house. The locations for the piercing holes are scribed with a height gage. If greater accuracy is required, buttons can be used for locating the holes, or the holes can be bored in a precision jig-boring machine.

The holes *B* for the guide pins and the clearance holes *C* for the heads of the stripper screws are bored at the same time. The piercing holes are counterbored $\frac{1}{8}$ in. larger and $\frac{1}{8}$ in. deep and are then reamed with a taper-pin reamer for clearance for the slugs. The die is then hardened and drawn. Scrap left from blanking is used for the locaters *D*, which are soldered to the die.

For the punch plate and the stripper plate, two pieces of $\frac{3}{8}$-in. cold-rolled steel are clamped together and to the die, and all holes are spotted through the die and then bored through both plates.

The holes in the punch plate for the punches and the guide pins are countersunk in the upper side. The punches and the guide pins are made from drill rod and are peened to fit the countersinks in the punch plate before being hardened. The guide pins project below the stripper plate far enough to insure a bearing in the die before the punches contact with the blank. Screws and springs for the stripper are standard.

Any punch press having a flat punch-holder in the ram can be used, as the whole assembly is placed on a plain bolster without being clamped. Tools of this type can be made at a low cost and have been used at a greatly reduced parts-cost over drilling the holes in a jig. From 2,000 to 5,000 blanks or more have been pierced by them.



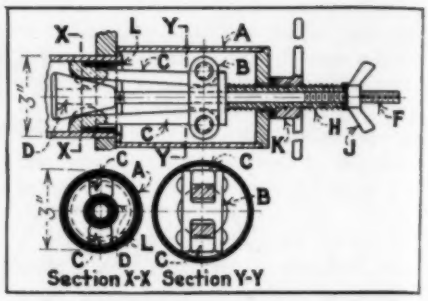
For production of limited quantity, piercing tools of this type give good service and can be made in a short time at a very low cost

Puller for Bearing Shells Discussion

J. T. TOWLSON
London, England

Referring to the article by Norman C. Irvine under the title given above (*AM*—Vol. 78, page 548), while not intending adverse criticism, I would like to know just how the device functions. Mr. Irvine tells us that the fingers are opened by a rod entered through the opening in the housing. No one needs reminding that such an opening as is required for that purpose is not usually present in the housing of an electric motor. If it were present, where is the need for the fingers and why could not a simple plate with a bolt and a nut be used?

While devices for the purpose described are familiar to some, a device used by the writer for many years, not only for extracting inaccessible bearing shells, but for extracting ferrules from boiler tubes as well, may be of interest.



Pivoted claws are expanded behind the ferrule by a conical wedge, and the ferrule is drawn from the tube by turning a nut on the extracting screw

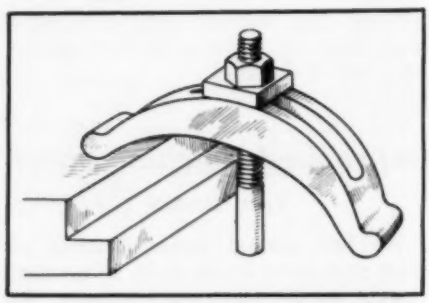
The device consists of the body *A;* the crosshead *B;* to which are pivoted the swinging claws *C;* the conical wedge *D* attached to the threaded rod *F;* the threaded tube *H,* which is integral with the crosshead and through which the threaded rod *F* passes; the thumbnut *J;* and the lever nut *K.* As shown, the device is set up for extracting the ferrule *L* from a 3-in. boiler tube.

In operation, with the swinging claws entered through the ferrule, they are expanded behind the bushing by drawing the conical wedge to the right by turning the thumbnut. Then both the claws and the crosshead are drawn to the right by turning the lever nut on the threaded tube, extracting the ferrule.

An Arch-Type Strap Clamp

CHARLES H. WILLEY

The strap clamp illustrated has been used to considerable advantage in holding dies on the bolsters of our presses. The long slot for the bolt and the concave washer permit the clamp to adjust itself in holding dies up to $1\frac{1}{2}$ in. in thickness without any blocking under the tail end. For thicker dies, the blocking required can be as low as $1\frac{1}{2}$ in. less than the die thickness.



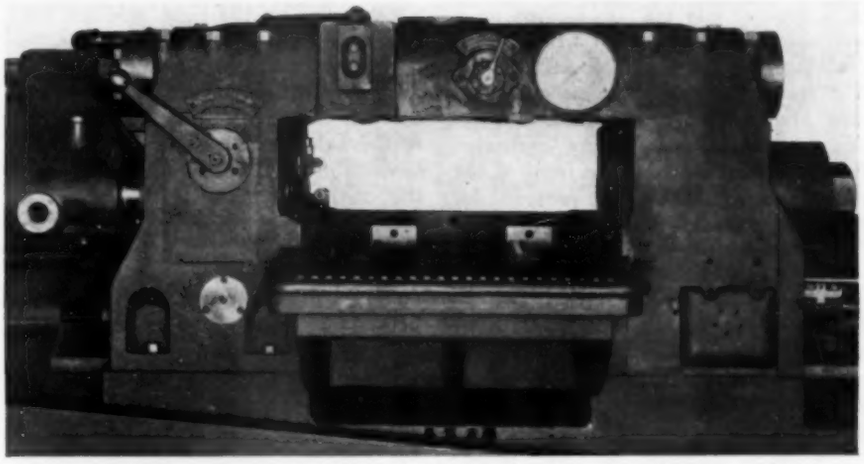
This strap clamp is self adjusting and will hold work up to $1\frac{1}{2}$ in. in thickness without blocking under the tail end

SHOP EQUIPMENT NEWS

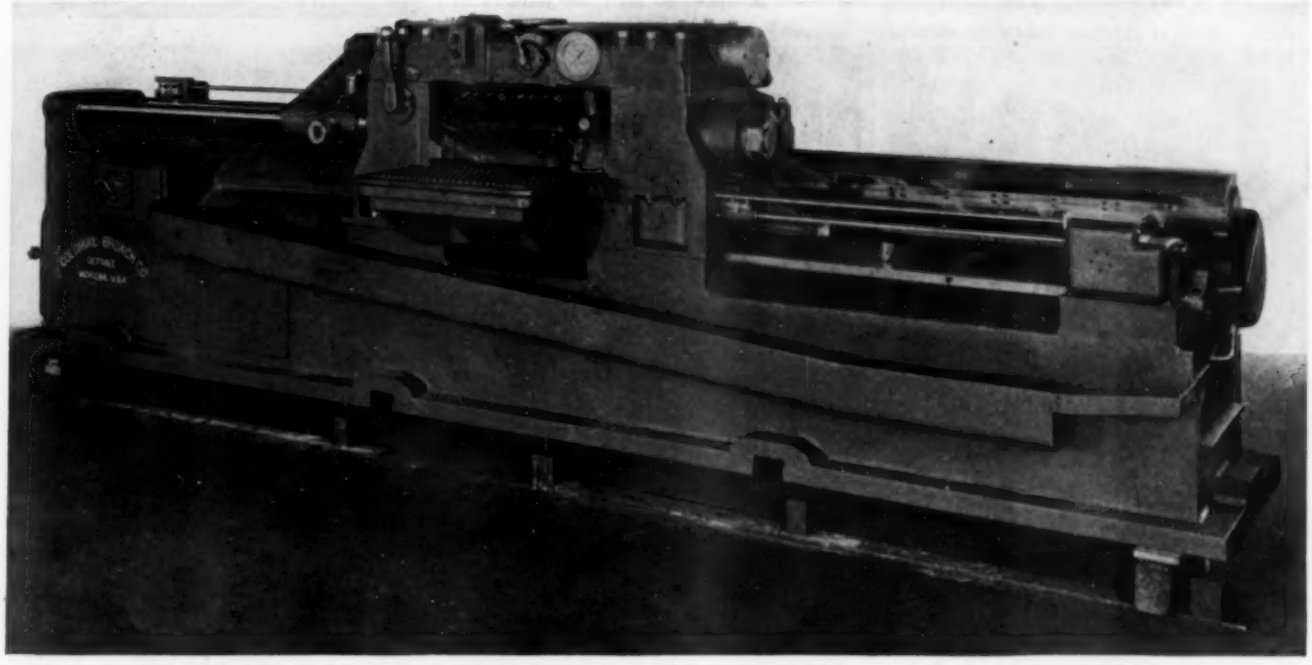
Colonial Two-Way Horizontal Special Hydraulic Broaching Machine

The Colonial Broach Co., Detroit, Mich., in cooperation with the Sterling-French Machinery Co., of the same city, has developed and built a special horizontal broaching machine, for align-broaching three camshaft holes in a cylinder block. The broach is handled automatically on this machine, leaving the operator to load and unload the work. Welded steel construction is used for the machine, which has an angular base and slide to shed the shavings by gravity. In the base there are four compartments; one for the motors; one for hydraulic equipment; one for an unusually large oil tank to insure a cool oil supply, and last, a large coolant and chip compartment.

The fixture is level with the conveyor height, allowing the operator to slide the cylinder block over a serrated plate to wipe the bottom before entering the fixture. When inserting the block it is brought up against two temporary stops for centering to facilitate the entrance of the locating plungers. These locating plungers are brought into place by the same lever that controls the cycle of the machine. On the completion of the broaching stroke, an auxiliary oil cylinder pushes the block from the broaching position to the front loading station, allowing the operator to slide the block onto the conveyor line. The broach then returns to the starting position to complete the cycle. The machine shown was specially designed for the above mentioned part, but can be fabricated to any size for any surface or hole broaching operation.



Located at conveyor height, the fixture has two temporary locating stops to center the block and two locating plungers for final centering. One level controls the locating plungers and throws in the hydraulic circuit that controls the complete broaching cycle



Three camshaft holes in a cylinder block are align-broached in this Colonial two-way machine. Cutting speed of the broach ram is 540 in. per min., and the rapid return is 720 in. per min.

Moline No. HF-140 Special Hydraulic Horizontal Boring Machine

A special horizontal machine for boring and facing rear-axle housings such as used for tractors, automobiles and trucks, has been developed by the Moline Tool Co., Moline, Ill. The spindles are opposed and are located on curved arms that project downward from the slide toward the work table. The two lowest opposed spindles, that is, the lowest one in each arm, are used for the roughing operation, the two center ones for the semi-finishing operation, and the two top spindles for the finishing operation. These spindles are not in a straight line but are located on a common arc, the center of which is the pivoting point of the table and fixture. The spindles do not traverse independently, but as a unit by means of a hydraulic pump and cylinders controlled from a central point at the front of the machine. Adjustments are provided for the depth of cut and reversal of the spindle units.

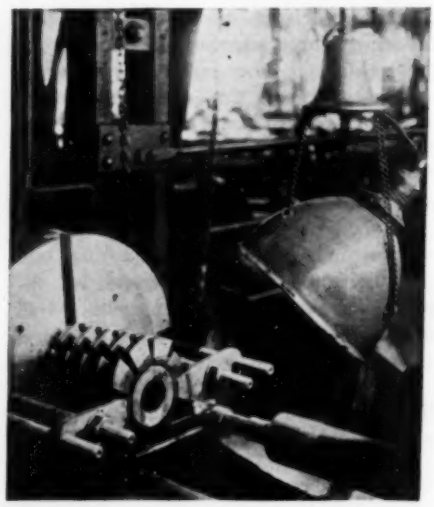
The boring of one-half of the axle housing is done at one setting; that is, boring the outer end and one side of the center bearing. The work is clamped in an indexing fixture which rotates 180 deg. to bring the other half of the axle into position for the boring operation. Indexing of the fixture loaded with an axle is easily accomplished because the entire fixture is raised off its bearings on rollers so it can be easily turned the 180 deg. by means of a hand lever. The fixture is mounted on a swinging member pivoted on pre-loaded, precision bearings, the center of which is also the center of the arc of the spindles. This swinging table is counterbalanced and operated hydraulically, being raised from the loading position to the three working positions. The overhanging arm in the center of the machine is provided with locating holes into which fit opposed plungers for holding the work rigidly while being bored.

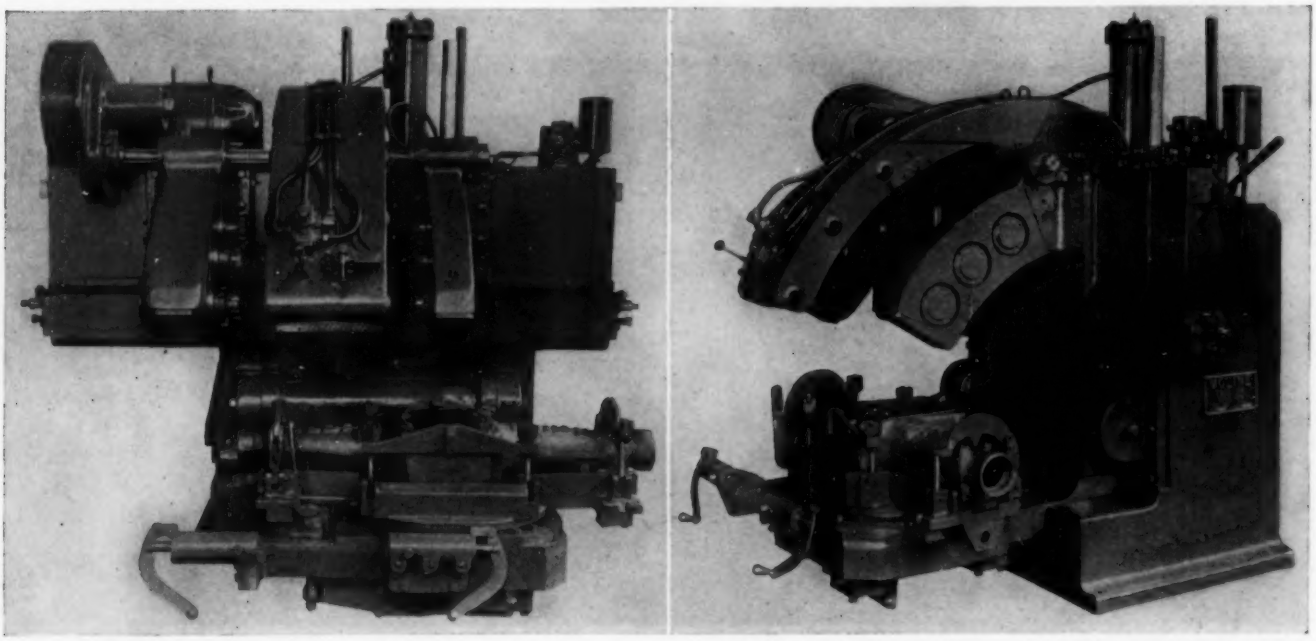
The spindles on the left side are used for boring the outside or end holes and the spindles on the right side are used for boring the inside holes. Thus, the housing or arm carrying the right-hand spindles must be small enough to pass through the large opening in the center of the axle housing. Because this arm is small in size, and rigidity is required, the casting is made of alloy iron. In fact, practically all of the castings used in the machine are of this material.

The cycle of the machine is such that after the work has been clamped in the fixture, the table is elevated hydraulically to the rough boring operation. This movement of the table is accomplished by a valve mounted on the overhanging arm in the center of the machine. When the table and fixture reach the first position the locating pins are inserted in the locating bushings, and the feed of the spindles is started by moving the lever controlling the hydraulic feed valve. The spindles feed the cutters in until they have reached a predetermined depth, at which point they dwell slightly to insure cleaning up the cut and then return to the starting position. The locating plungers are then withdrawn, the table is elevated to the second position and then to the third position. Lastly, the table is lowered to its original loading position. The fixture is indexed 180 deg. and the operations are repeated. Timing of the working cycle is done by adjustment of the hydraulic valve. Weight of the machine is 20,000 lb.

Foell Industrial Drop Light

William Edlich, Delawana, N. J., is importing the patented "Foell" drop light for industrial applications. As shown by the accompanying illustration this drop light can be readily adjusted





Left—The two outer arms each carry three milling cutters, and the center arm has locating plungers for the three positions. Right—Cutters are arranged in an arc. The table is lifted to each set of spindles in succession

close to the work in the machine. The parabolic reflector is supported by an endless chain which runs in the bead on the supporting shell above. This bead is divided into three equal sections and the chain runs freely so that the reflector can be tilted to any angle. The reflector will accommodate the usual size electric bulb for high intensity lighting directly on the work.

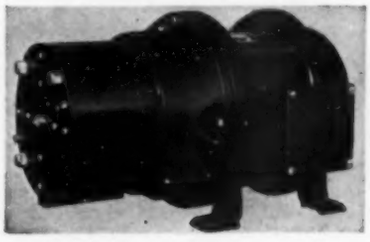
Reed-Prentice Taper Attachment for Lathes

The Reed-Prentice Corp., Worcester, Mass., has designed a taper attachment for use with its line of sliding-gear-head engine lathes, available in 12, 14, 16 and 20 in. sizes. The attachment is designed to retain all the advantages of the telescoping, cross-feed-screw type of attachment and arranged to be used as a conventional taper attachment if desired. It is capable of turning any included angle up to 120 deg. The attachment permits of turning a straight portion on the work to a predetermined point, at which the taper attachment may be engaged and the taper turned to another predetermined point where it may be disengaged, and the machine resumes straight turning. A scale at the left-hand end of the taper bar permits setting to the desired angle and is arranged to indicate included angles. The attachment is also made as a forming attachment in which the master form has a greater length than the form produced on the work, thus permitting use of a roller follower for producing relatively sharp corners.

In operation the shaft is turned straight to the point where it is desired to start the taper, and then the engaging lever on the right-hand wing of the carriage is moved to engage a clutch. Following this the entire tapering attachment slide is set in motion. This motion is stopped at will by disengaging the clutch. Determination of the angle of taper is dependent upon both the rate of movement of the slide relative to the carriage travel, and the angularity of the taper bar. Safety stops are provided.

General Electric Disk-Type Electric Brake

A compact, smooth-acting, disk-type of electric brake, designed for mounting directly on a number of types of G-E motors, has been announced as an addition to the line of solenoid- and thrustor-operated brakes manufactured by the General Electric Company, Schenectady, N. Y. This brake is intended especially for controlling small hoists, cranes, winches, and similar equipment.



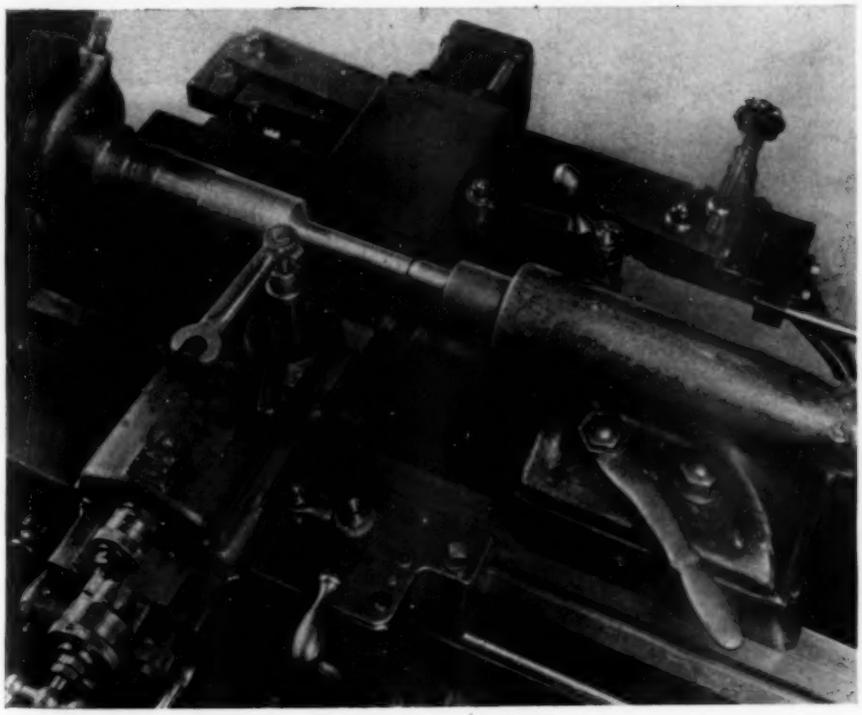
It is suitable for applications requiring no more than 50 lb.-ft. braking torque on a continuous basis, or 75 lb.-ft. on an intermittent basis.

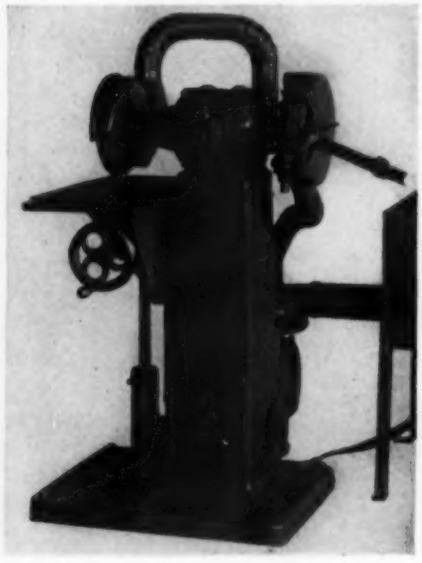
The brake is obtainable completely mounted and wired, as a shipped-assembled unit on G-E ball-bearing squirrel-cage, wound-rotor, or single-phase and d.c. motors in the NEMA frames. The brake is also available separately and may be easily adapted to floor-mounting for use with other types of motors already in service.

In construction, the device is somewhat similar to an automobile clutch of the multiple-disk type. Braking pressure is applied whenever the motor power-supply is interrupted, by an adjustable, calibrated helical spring which forces the non-rotating disks against the rotating ones which are splined to the motor shaft. The braking torque thus caused is removed when the voltage is restored. A magnetic system compresses the spring and releases the pressure against the disks.

Standard Surface and Tool Grinder

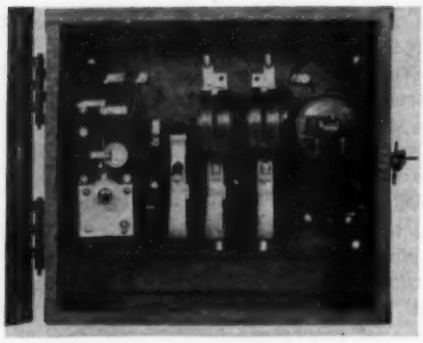
The Standard Electrical Tool Co., 1938-48 West Eighth St., Cincinnati, Ohio, is prepared to furnish a surface and tool grinder in 1 hp. and 2 hp. sizes. These machines are equipped with 10x 1- and 12x1½-in. grinding wheels, respectively. The table measures 11x21 in. Five turns of the handwheel adjusts the table 1 in. The handwheel spindle is fitted with an adjustable dial graduated in thousandths. Maximum distance of wheel to table is 12 in. The illustration shows a machine fitted with a twist drill grinding attachment and exhaust blower attachment, which are optional. Net weight, 550 lb.





General Electric Automatic Timer for Spot and Projection Welders

A Type CR7993 synchronous-motor-operated timer for automatically timing the power supply to resistance welders, by controlling the contactor on the welder, is available from the General Electric Company, Schenectady, N. Y. The timer is easily set for the time most suitable for the work in hand, and once set the time is unaffected by the line-voltage variations or surges. Setting the timer to provide a given duration of welding current is accomplished by means of a graduated disk associated



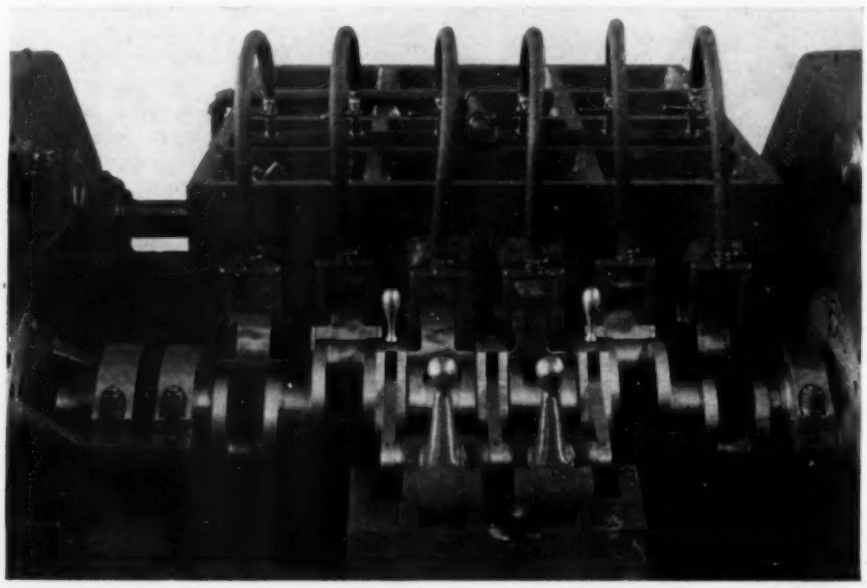
with the second projection on the timer motor shaft. A range from $\frac{1}{2}$ to $\frac{8}{8}$ sec. in one-cycle steps (60-cycle supply) is thus available, a range which is suitable for all usual welding.

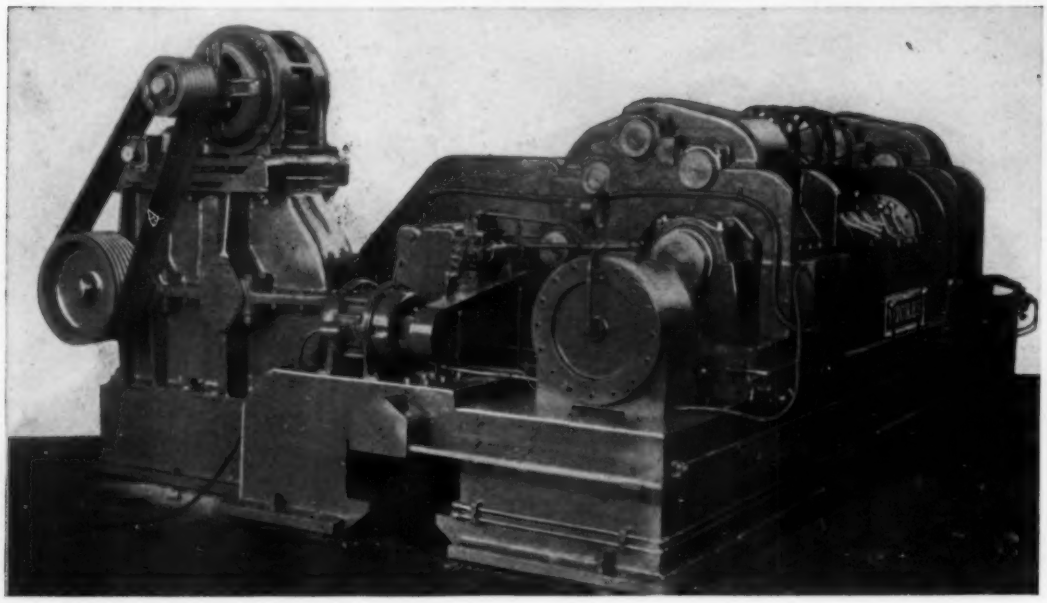
Sundstrand Index Base

An index base with single lever control is being produced by the Sundstrand Machine Tool Co., Rockford, Ill. The accompanying illustration shows a base in working position on a milling macine table. However, the base can be made with the operating lever and clamping segments reversed so that it can be used in pairs of "rights" and "lefts." Movement of the single lever operates clamping bolts through two pairs of toggles and a slide to clamp the upper and lower parts of the base together, or to release the upper part for free rotation. Ground wear strips of hardened steel come together when the two parts of the base are clamped to insure alignment. Additional clamping action is secured through a roller which rides on a cam surface on the under side of the slide, so that the upper and lower

Wickes Contour Turning Lathe

For simultaneously turning the contours on the twelve crankarms of a heavy 6-throw, 7-line bearing crankshaft, the Wickes Bros., Saginaw, Mich., have developed the contour turning lathe shown. A similar machine is used for simultaneously turning the 24 chamfers on the crank arms. The first lathe takes a heavy roughing cut, immediately followed by a fine finishing cut. The crankshaft is supported in and driven by a heavy pot chuck at each end and supported on three center bearings by means of a roller rest. Because the crankshaft is very large and of material having a Brinell hardness up to 385, the lathe is heavily built throughout, and the net weight is 62,000 lb. The machine is driven by means of a 30-hp. constant motor through a speed reducer. Separate motors are used for the hydraulic pumps and cooling compound.





Above — Close-up view of the tooling equipment. The crankshaft is supported in and driven by a heavy pot chuck at each end and supported on the three center bearings by means of a roller rest

Left — Wickes Bros. Contour Turning Lathe for simultaneously turning the contours on 12 crank arms of a heavy 6-throw, 7-line bearing crankshaft

Quick indexing of the Sundstrand Index Base is facilitated by a ball thrust bearing and a flat-sided detent that enables accurate alignment of the upper part of the base with the index bar

A removable clutch pedal eliminates danger when resetting dies, and is attachable without tools at any position at the front of the bed

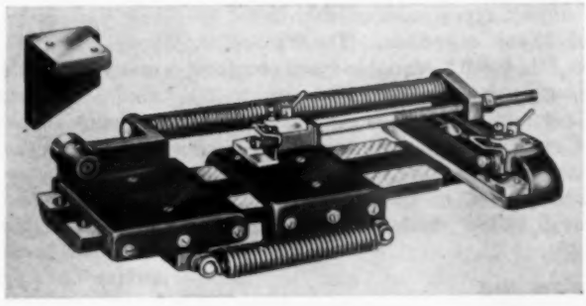


Fig. 1—Dickerman 4-in. Hitch Feed for power presses. The main spring is at the top and the side springs at the bottom remove all lost motion in the mechanism and add pull for the stock feed. The operating cam is at the upper left

parts of the base are drawn together firmly at the center.

These index bases are made in six sizes ranging from 12 x 24 in., to 20 x 30 in., and the net weights range from 325 to 700 lb.

Dickerman 4-In. Hitch Feed

The Producto Machine Co., Bridgeport, Conn., is distributing a larger size of the Dickerman Hitch Feed for power presses. A 4-in. model is now available in addition to the 2-in. size. This mechanism is applied to a power press to feed the stock automatically through the die. The attachment itself is fitted to the die holder and the operating cam is fitted to the punch holder. On the upward stroke of the press the springs release, thus feeding the stock to the required and predetermined feed, which is obtained by setting a nut on the adjusting screw. The springs control the slide on

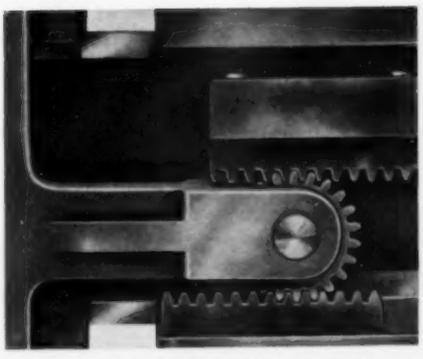


Fig. 2—A double rack and pinion underneath a portion of the slide provides for a movement double the press stroke

which the gripper plate is mounted. A double rack and pinion underneath a portion of the slide provides for double the motion of the gripper slide. Feed length is 0 to 4 in. with presses having 2 in. stroke or more, and double the stroke with presses of less than 2 in. stroke. This feed will accommodate material up to 8 in. in width. Thicknesses up to 1/16 in. on wide width material and up to ⅛ in. on narrow width material can be accommodated.

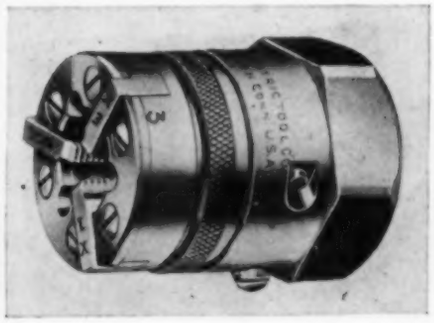
Steelweld All-Steel, Press-Type Bending Brake

Vertical, press-type, bending brakes are being produced by the Steelweld Machinery Co., E. 70th and Machinery Ave., Cleveland, Ohio, using box-type steel welded housings with a deep throat. The standard throat depth is 18 in., and enables the user to turn up larger flanges than customary in this type of machine for the entire die length, and also provides a means of giving the design a certain resiliency. The machine can be used as a jobbing machine. Work longer than the normal capacity between the housings can be handled. Not only are the side sections made in the form of box housings, but the crown is also in the shape of an open box to reduce the height and to tie the frame together.

All sizes are twin-gear driven and the eccentric shafts are solid forgings. The eccentric comes immediately above the ball joint, which is a steel cylinder welded into the ram. The flywheel is mounted on a roller bearing and it is placed between the housings. Clutch and brake are of twin-disk design and are mounted on the opposite sides of the housing to prevent overheating. The flywheel is drilled so it air-cools the clutch. The ram can be swiveled so that on a 10-ft. machine taper work up to ¼ in. taper per ft. can be done. All bearings, except the main bearings and slides, are equipped with roller or ball bearings.

Geometric Style EJ Removable-Chaser Diehead

The Geometric Tool Co., New Haven, Conn., is marketing the Style EJ removable-chaser diehead for cutting very small diameter, short-pitch threads now being handled primarily with a solid



tool. The ¼-in. style EJ diehead complete with chasers weighs but 3 oz. It is built to cut threads from No. 0 up to No. 14 machine screw sizes and in pitches of 20 threads or finer. In use on the Brown & Sharpe No. 00G automatic screw threading machine tooled up for a brass screw, 60 screws were completed per minute. The work spindle ran at 5,000 r.p.m. and the die spindle at 7,000 r.p.m.

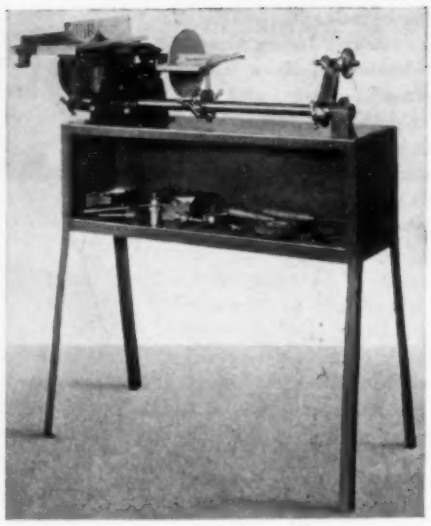
Bodine Electric Governor-Controlled Motors

The Bodine Electric Co., 2264 West Ohio St., Chicago, Ill., has added larger sizes to its line of electric-governor controlled motors. The additional sizes range from 1/10 to ¼ hp. The line is available in series and compensated-series types and in an approximate speed range from 500 to 7,500 r.p.m. These motors are also available with built-in worm gear speed reducers of various ratios, the highest of which is 60 to 1.

General Electric "Workshop"

The General Electric Company, Specialty Appliance Sales Department, Nela Park, Cleveland, Ohio, has announced the "Workshop," a combination machine designed to do all sorts of operations in wood and the softer metals. Although intended primarily for the home workshop, this equipment has certain experimental and laboratory applications. It has an unusual clamping arrangement that makes it possible to change from one attachment to another in a few seconds.

The operations that can be performed are as follows: Saw wood—cross-cut or rip—up to 1¾ in. thick, at any desired angle or bevel; turn wood with a limit of 9-in. diameter for face-plate work; take lengths of 30 in. between centers; readily turn brass and aluminum; sand flat surfaces and contours; scroll work on wood up to 2 in. thick; scroll work on metals including sheet iron; drill both wood and metal; make mortises and tenons; drill dowel holes; cut rabbets and grooves; grind and buff.



American Series SB-42 Hydraulic Surface Broaching Machine

The American Broach & Machine Co., Ann Arbor, Mich., is introducing the SB-42 Series of hydraulic surface broaching machines in which the length of stroke is 42 in., and in which single or duplex types are available in 6-, 10- and 15-ton capacities. These machines are fitted with variable-speed controls giving surface cutting feeds up to 30 ft. per min.

Construction of the machine is similar to that used by the above company for several years, in that the column is a heavy, hollow vertical member, having box-shaped ways and hardened and ground tool-steel way caps. The broach slide is the cylinder itself, and the slide and cylinder units add to the rigidity and stiffness. Either the American or the Vickers hydraulic pumping unit is supplied, and it is submerged in the reservoir at the lower part of the column. The standard practice on this company's machines has been to use the V-clamp method, which permits the removal of any section of the broach without screws. Thus broaches can be adjusted in the event of wear. Where the wear becomes extreme, the broach section can be moved down to the next lower or roughing portion.

Fig. 1 shows a duplex machine, No. SB-42-10, arranged for broaching a flat and bevel on the flanges at the end of an automobile rear-axle housing. Both slides work simultaneously. The broaching operation is shown in Fig. 2. Location of the part is from flat surface at the center of the axle. The fixture is manually operated by withdrawing jaws that provide clamping pressure by means of a cam. This fixture is operated by the levers centrally placed on the machine.

The machine can be supplied so that

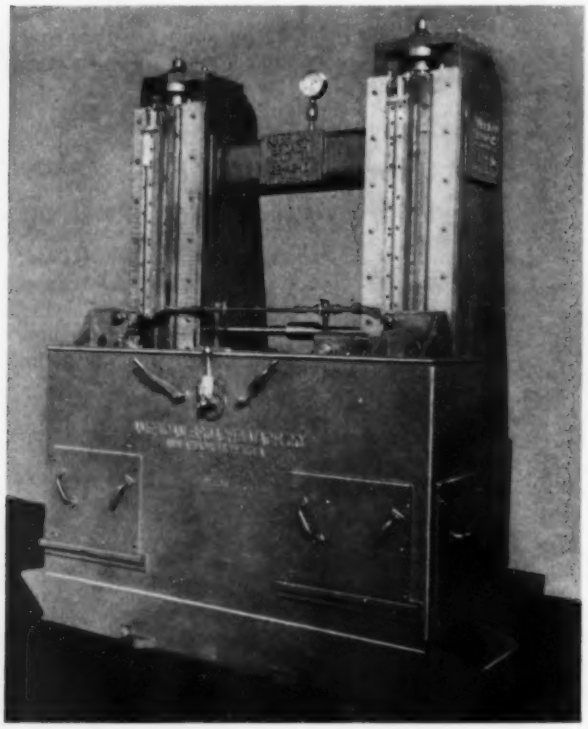


Fig. 1—American series SB-42-10 Duplex Machine which has a stroke of 42 in. and a capacity of 10 tons

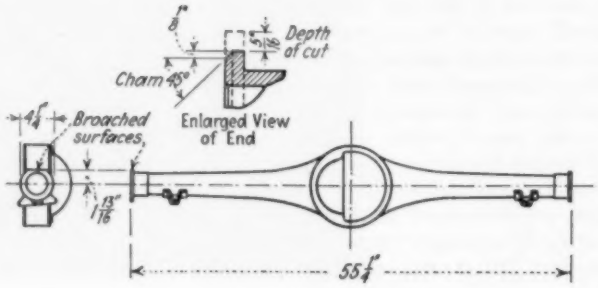
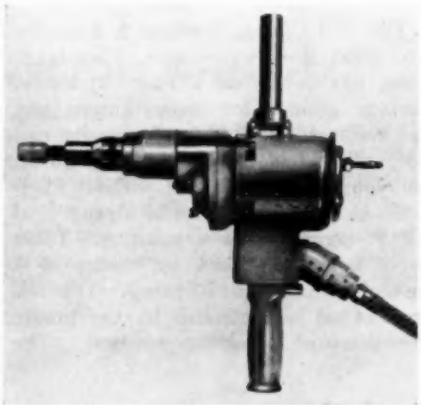


Fig. 2—Rear-axle housing which has a flat and bevel broached on the flanges at each end

both slides will operate simultaneously, as shown, or for independent control of each slide, or so that one slide is on the cutting stroke while the other is returning. Dogs provide for any desired stroke. Release valves can be set for any maximum pressure, and a direct-reading gage shows the pressures exerted. Rapid return feed is available on these machines and they are operated on a fast cycle and can be furnished for continuous operation when desired. Indexing work tables, sliding work tables for feeding the work directly toward the broaching tool, or tilting work tables can be furnished.

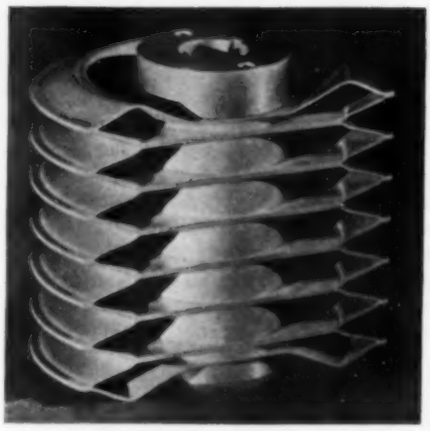
"Hercules" No. 40-N Nut Runner

The Buckeye Portable Tool Company, Dayton, Ohio, is marketing the "Hercules" No. 40-N nut runner with a speed of 750 r.p.m. and a capacity for ⅜-in. and light ½-in. nuts. This tool is similar in construction to the No. 30-N previously introduced and weighs 16½ lb. The overall length is 14½ in. A "shockless" feature permits running a nut on its thread and bringing it up tight without shock to the operator. This feature centers in a clutch which is arranged with an adjustable releasing cam to trip the clutch open when the nut is brought down tight. The operation does not depend on friction in the drive. After the cam operates, the tool runs free.



"Duro-Brace" Texsteel Sheave

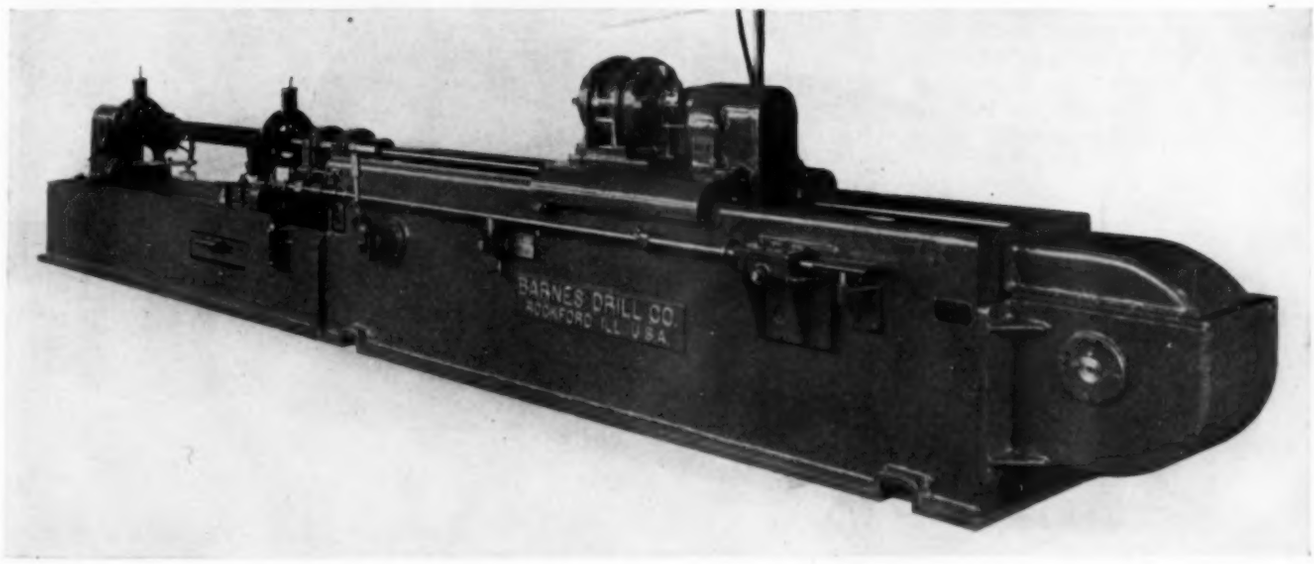
The Allis-Chalmers Mfg. Co., Texrope Division, Milwaukee, Wis., is introducing a reinforced steel sheave known as the "Duro-Brace" Texsteel Sheave. Outside walls of sheaves sometimes bend under the strain of excessive overloads, with the result that they are thrown off true. Duro-Brace sheaves are reinforced by a convex steel plate that strengthens these areas. Welding at the rim and web for additional strength and the interior grid-type construction are features of the former design, which are retained in this construction.



Barnes No. 5 Horizontal Honing Machine

For long work such as tubing and cylinders of such large size or length as to prevent honing them vertically, a horizontal hydraulic honing machine is being built by the Barnes Drill Co., Rockford, Ill. This machine is available in various sizes and lengths of spindle travel. The No. 5 machine illustrated incorporates many of the manufacturer's patented features and several additional features. This honer handles all bores up to and including 5 in. in diameter in iron or steel. While it is shown here with a 6 ft. spindle travel the machine can be furnished for longer or shorter travel. The No. 10 and No. 15 sizes are built for larger and heavier work.

One of the features of this machine is the method of reciprocating the carriage on which is mounted the spindle, driven from the electric motor on the carriage. A fluid motor is used to give the full hydraulic influence, the same as that of a hydraulic cylinder, and yet to make possible a much shorter length of main bed. One master lever at the operator's station near the middle of the machine controls the starting and stopping of the spindle rotation and also the starting and stopping of the spindle reciprocation. Auxiliary means are supplied for short stroking at any point in the entire spindle travel, a desirable feature for the removable of taper and high spots in the cylinder. The outer work-supporting bed contains a coolant reservoir and a filter. Hone and hone



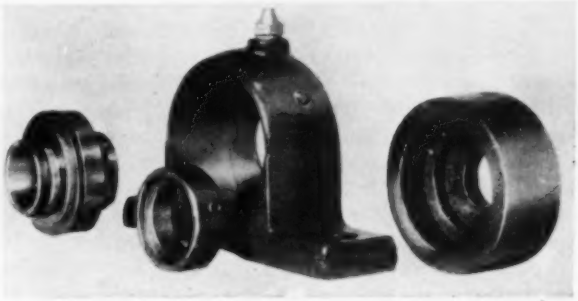
guide bushings or cradle are supplied according to the requirements of the work. Coolant is fed through the anti-splash guard from the rear end of tubing, and the overflow is carried through oil channels to front end of the work-supporting bed, where it cascades into the settling tank and is filtered. Spindle rotations and reciprocations are arranged to suit the job. Take-off gears provide for any desired speed, and the volume control gives an infinite range and rate of stroking.

Fafnir Cork-Insulated Ball Bearing Pillow Block

The Fafnir Bearing Co., New Britain, Conn., has developed a cork-insulated, ball-bearing pillow block having the features of silence, self-alignment, freedom from friction, compactness and ease of assembly. The bearing is of the wide-inner-ring type with a self-locking collar. It has a deep-groove, large-ball design that affords high load capacity, thrust as well as radial. The pillow block is prelubricated and lubrication is renewable by means of grease tubes at the fittings included in the housing. The insulation is a cork pad which fits into the housing and around the bearing to insure silent operation. This cork pad also acts as a seal against the escape of lubricant or the entrance of dirt.

"CP" Balancer for Portable Tools

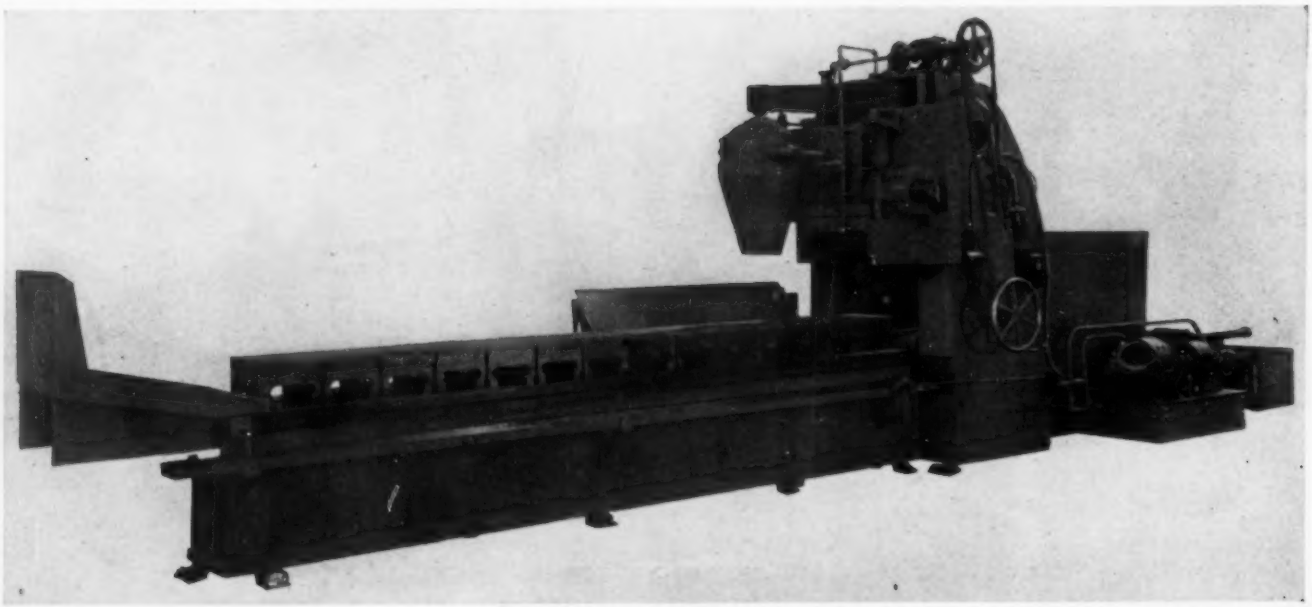
The Chicago Pneumatic Tool Co., 60 E. 44th St., New York, N. Y., is manufacturing a "Super Safety" balancer for portable tools in seven sizes to handle loads from 30 to 200 lb. It is said that the combination of a tapered drum, single cable and an improved method of applying the spring force gives the balancer a long, balanced travel. The constuction eliminates sheaves and swivels. Two ball bearings at each end of the shaft provide support for the spring mounted between them. The up and down stopping point is regulated by a mechanically-operated geneva gear independent of the cable. Both hooks furnished are of the closed throat or safety type. The top hook is arranged for lateral adjustment to insure proper centering of cable and the object. In the event of spring breakage, the safety latch engages the teeth of the drum and prevents the load from dropping.



Right—The cork pad, extreme right, provides insulation of vibration and seals in the lubricant

Hill 14-Ft. Hydraulic Surface Grinder

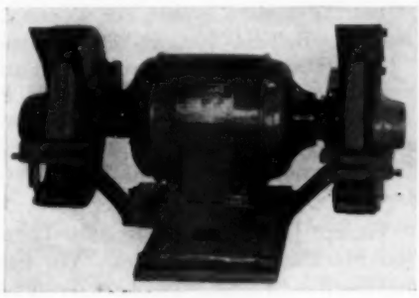
The Hill Clutch Machine & Foundry Co., 6400 Breakwater Ave., Cleveland, Ohio, has developed a 14-ft. hydraulic surface grinder for shear knives and flat surfaces. This type of machine can be furnished in table lengths of 10 ft. and longer and with and without magnetic chucks. The head is arranged to tilt to permit concave grinding. Table drive is accomplished by means of a motor-driven hydraulic pump. The volume of oil is controlled by the pump, the pressure remaining constant. The



grinding head is counterbalanced and the 5 ½ in. spindle is equipped with two Timken roller bearings and one ball bearing in the center.

Standard 10-In. Special Bench Grinder

A special bench grinder equipped with 10-in. diameter by 1-in. face grinding wheels is being made by the Standard Electrical Tool Co., 1938-48 West Eighth St., Cincinnati, Ohio. The machine is intended for intermittent use and can be furnished with a buffer extension in place of the grinding wheel on the right side.

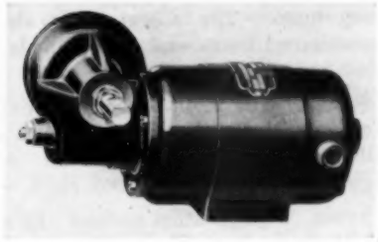


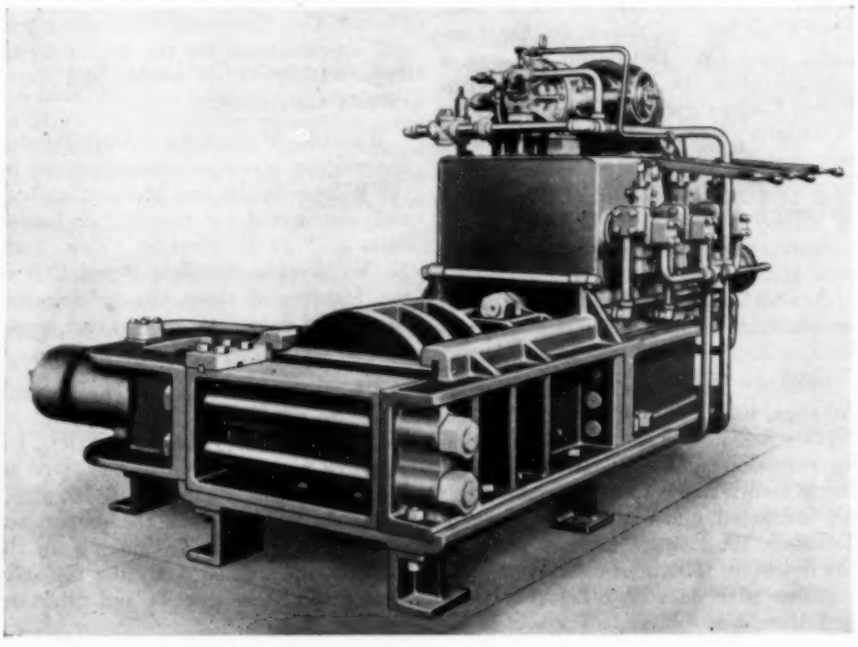
"H-P-M" Scrap-Metal Baling Press

A box-type, scrap-metal bailing press incorporating the company's "Hydro-Power" principle of operation has been developed by the Hydraulic Press Manufacturing Co., Mount Gilead, Ohio. The press is completely self-contained with its motor-driven Hydro-Power unit mounted directly on the press at one end. The machine consists of a box built up of massive ribbed steel castings to take the loose scrap metal. It is closed by a heavy sliding door, actuated by a hydraulic cylinder. Pressure is applied to the scrap from two directions, first from the end, and then from the side by platens moving into the box and operated by hydraulic rams. Two pumps, each of the rotary, high-speed type, build up the pressure. The first pump delivers a large volume of oil at medium pressure, and the second pump builds the pressure up to the maximum.

Dumore Motor with Built-In Speed Reducer

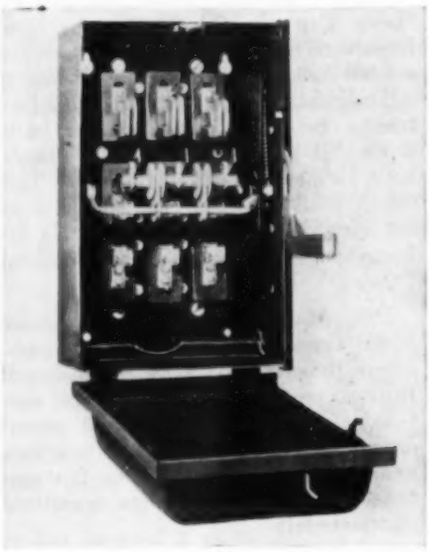
The Dumore Co., Racine, Wis., is now building a Type K3-M 1/7-hp. motor with a built-in speed reducer. The single gear reduction unit can be supplied in three ratios from stock—5 to 1, 14½ to 1 and 34 to 1, giving shaft speeds of 1,300, 448 and 191 r.p.m. The illustration shows the standard mounting but the gear unit can be positioned so that the gear shaft projects at any desired angle in relation to the base.





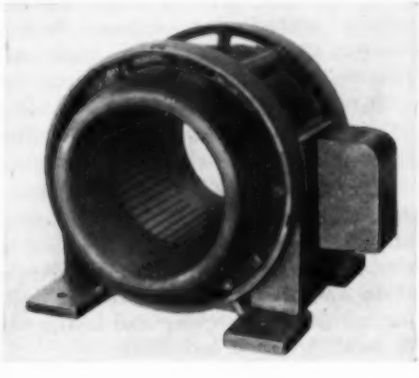
Square D 30-Amp. Switch

A 30-amp. switch in 2- and 3-pole fused and unfused and 3- and 4-wire solid-neutral models is being added to its "80,000 line" by the Square D Co., Switch & Panel Division, Detroit, Mich. The switch has an elevated, removable base for simplified wiring, and is similar in this respect to the "50,000 line," introduced a year ago. The switch has a front-operating handle, and the cover opens down instead of at the side.



Allis-Chalmers "Seal-Clad" Squirrel-Cage Motors

The Allis-Chalmers Mfg. Co., Milwaukee, Wis., has introduced "Seal-Clad" squirrel-cage motors of the open-type construction, but with permanent coil protection. Bakelite shields are sealed over the stator coils giving protection against dust, oil, moisture, acids and other agents injurious to the insulation. These motors are built in ratings up to 25 hp., 1800 r.p.m. They have cast-steel frames and silver-brazed stators. Oil and dust-tight sleeve bearings or anti-friction bearings are used.



• TRADE • PUBLICATIONS

ABRASIVES. The Norton Co., Worcester, Mass., has published a pamphlet "Abrasives—Their History and Development" which shows how its abrasives have been utilized by the various industries. Manufacture of these abrasives and methods of securing various physical properties are discussed.

BALL BEARINGS. Under the title of "Let's 'Can' the Oil Can!" The New Departure Manufacturing Co., presents a small booklet describing the self-sealed, self-lubricating ball bearings manufactured. Some of these bearings have single felt seals, some of them double seals, some sealed on one side and shielded on the other. The booklet does not give dimensions or prices; this information being found in the General Catalog.

DIE MATERIALS. The Meehanite Metal Corp., Pittsburgh, Pa., has published Bulletin No. 3 by its Research Institute on the subject of die materials. The bulletin discusses economies of construction of cast-to-form dies, and gives service records for the materials in a variety of press operations and materials.

END MILLS. The Putnam Tool Co., 2981 Charlevoix Ave., Detroit, Mich., has published a catalog on "Hi-Speed" single and double end mills, and also on the complete line of standard cutting tools.

FLEXIBLE COUPLINGS. A data book on its couplings has been issued by the Ajax Flexible Coupling Co., Westfield, N. Y. These couplings are offered in heavy, medium and light-duty types, and suggestions on special couplings are illustrated.

FURNACES. A line of box-type, air-draw furnaces is described in Bulletin HD-934, published by the Hevi Duty Electric Co., Milwaukee, Wis.

FURNACES. A 12-page Bulletin GEA-1924, being distributed by the General Electric Co., Schenectady, N. Y., describes controlled-atmosphere electric furnaces and their auxiliaries. Both continuous and intermittent furnaces for such uses as bright annealing, scale-free hardening and normalizing, and electric furnace brazing are featured.

LAY-OUT DEVICE. The Dayton Roggers Mfg. Co., 1845 East Franklin St., Minneapolis, Minn., has issued a circular containing data on the Angle Plate and Holocator for locating, drilling, measuring, checking and laying out of small precision tool work.

LENGTH GAGE. A bulletin published by the Sheffield Gage Corporation, Dayton, Ohio, briefly describes its adjustable-length gage, available in both heavy-duty and normal-duty models, as well as double-end and progressive types.

MOTORS. Advantages and economies of shaftless motors for driving production machinery are given in a 8-page Bulletin No. 516 being distributed by The Louis Allis Co., Milwaukee, Wis.

MOTORS. Bulletin No. 1020, entitled "A Service to Manufacturers of Motor Driven Machines," issued by the Imperial Electric Co., 64 Ira Ave., Akron, Ohio, illustrates the application of motors to various types of drives, and outlines the reasons why the small motor manufacturer can render a specialized service on such drive problems.

OXYACETYLENE APPARATUS. A 1934-35 catalog has been issued by The Alexander Milburn Co., 1416 West Baltimore St., Baltimore, Md., covering its oxyacetylene apparatus, paint-spray equipment and portable carbide lights.

PRESSURE REGULATORS. The Air Reduction Sales Co., Lincoln Bldg., 42nd St., New York, N. Y., has published a booklet "Pressure Regulators and Regulation Problems" of interest to users of oxygen, acetylene and other gases. The booklet contains numerous diagrams and charts arranged to permit the reader to grasp quickly the salient facts about pressure regulators and the methods of solving regulation problems.

STEELS. The Firth-Sterling Steel Co., McKeesport, Pa., has issued folders on "Blue Chip" high-speed steel and "Circle C" super high-speed steel.

STEEL. A publication entitled "Effects of McQuaid-Ehn Grain Size on the Structure and Properties of S.A.E. 1040 Steel" has been published by the Carnegie Steel Co., Pittsburgh, Pa., as a supplement to the book "Carnegie Controlled Carbon Steels." The desirability of uniform structure at the heat-treating temperature, which can be obtained only by a control of grain size in steel manufacture, is clearly demonstrated.

STEEL. Bliss & Laughlin, Inc., Harvey, Ill., are distributing a circular on "Ultra-Cut" high-sulphur grade bessemer steel with free machining qualities.

STEELS. The Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y., has published a catalog section on corrosion and heat-resisting steels, being known as Section 3. These steels are marketed under the trade-name of Rezistals. A lengthy table is given on the resistance to various corrosive agents, together with data on other properties, and then it is followed by a section on the general working and fabricating properties. Following this material there is given information pertinent to each of the Rezistal KA2 steels.

STEEL TABLES. The Timken Steel & Tube Co., Canton, Ohio, has published a series of tables entitled "Multiples at a Glance," to enable the steel user to tell either how long his stock must be to furnish a definite number of multiples, or how many multiples can be cut from a given length of stock.

STRIP ROLLING MACHINE. The Swanson Machine Co., Jamestown, N. Y., has published a folder on its gearhead strip roller for the production of shapes from strip. The folder also describes an automatic cut-off saw for metal moldings.

TEMPERATURE CONTROL FOR FURNACE ROOFS. Bulletin No. 53-116, entitled "Temperature-Limit Control for Furnace Roofs," available from Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa., discusses a new method for protecting furnace roofs from overheating.

TURRET LATHES. The Jones & Lamson Machine Co., Springfield, Vt., has published a 32-page booklet on the ram-type, universal turret lathe, including complete specifications, a photograph of each tool with a description of its use, as well as line cuts of the tools with dimensions.

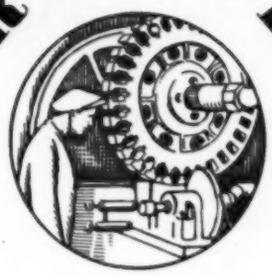
WELDING SETS. General specifications for belted or direct-driven, Type SA300, SA400 and SA600 shielded arc welders are shown in Specification Bulletin No. 303 issued by the Lincoln Electric Co., Cleveland, Ohio.

WELDING MACHINES, ELECTRIC. Bulletin No. 304 published by the Lincoln Electric Co., Cleveland, Ohio, gives general specifications for the engine-driven Type SA300 electric welder, and shows various mountings.

WELDING MACHINES. "Airco-Wilson" arc welding machines, manufactured by the Wilson Welder and Metals Co., Inc., and distributed by the Air Reduction Sales Co., 30 E. 42nd St., New York, N. Y., gives a complete description of the features of these arc welding machines and data on the types and capacities available.

ZINC PLATING. The R & H Chemicals Department of the E. I. du Pont de Nemours & Co., Wilmington, Del., has prepared a new edition of the "Operating Manual for Plating with Duozinc." The data given include the preparation of material for plating, making up the solution, operations, analyzing the solution, testing the deposits and other details.

THE ROUND TABLE



Trade Schools

"Say Al, what do you suppose has become of all the trained men we used to have? Have they all died or gone to selling hot dogs?"

"Partly both, Ed. And that reminds me that I wanted to talk to you about training a young man or two."

"There ought to be plenty ready to jump at the chance, but there doesn't seem to be. We haven't been training any boys for years. But can you get any who will bind themselves for three or four years?"

"I don't want to, Ed. I don't believe the old way was best either for the apprentice or the shop. Why should a boy spend years doing all the dirty jobs in the place, for almost no pay, and be kidded into thinking he was learning the trade?"

"Well, he'd pick up a lot of useful information about machines, even if he was doing laborer's work. Sort of got the 'feel' of things, Al."

"Seems to me that system was a waste of time, Ed, and mighty discouraging to a boy. Of course, he picked up some knowledge of machines, but he could learn more about them in three months in a good trade school than in the average shop."

"Gone collegiate, have you Al? And after all these years. Guess you never ran into some of the dumb clucks that graduate from trade schools."

"No, I haven't Ed. Have you? Or are you only passing on something you've heard?"

"Partly that, I guess, Al. But I can't help feeling that the shop is the place to train boys for shop trades."

"I'll go part way with you Ed. But I'm going to let mine get some sort of start in a trade school. I'm expecting two boys next week; they've had six months in a good school."

"You don't think they'll be machinists I hope, Al. If you do, you'll be disappointed."

"Of course not, Ed. But they'll know how most of our machines operate. They will know that screws and gears act the same way in a lathe as in a milling machine. That's more than some shop trained specialists seem to know. They get scared if you put them on a new machine."

"And still you think they won't call themselves machinists. I'll bet they'll be too cocky to live with; I'd rather have a boy who has served six months in a good shop."

"I've watched both kinds Ed. The school has nothing to do but teach about machines. The shop foreman has a dozen other jobs on his hands. So I'm betting it takes less time to make these trade school boys into good machinists than those trained entirely in the shop."

Can a trade school give the boy as good a preliminary training as the shop? Does the foreman have time to teach the boy what he should know?

Discussion

The Better Foreman

Present-day foremen should be leaders, not drivers. They should know how the jobs are to be done in the most efficient manner and be able to instruct their men how to do them. But it is not necessary that they should be able to do the actual work better or faster than their men. A good foreman will get the work done efficiently, keeping his men contented and making them feel that the job is worthwhile. Each man is a complex human problem, and no foreman will make his department efficient unless he makes an intensive study of human nature.

The main qualification for a foreman is leadership. A good foreman is the first to give credit where credit is due. A wise foreman values the support and respect of his men, but he cannot expect to find in his men qualities that he does not possess himself, for the foreman's behavior is passed on to his men. He should experiment with methods for controlling his men, just as he experiments with methods of production.

If Al can find a foreman with all these qualities, he has nothing to fear.

—H. A. GILLILAND,
Hamilton, Ontario, Canada

It seems to me that Ed has the better idea as to the duties of a foreman. I cannot agree with Al when he says it is not necessary for a foreman to know anything about the job to be done. A foreman should be a fairly expert workman, so that he can tell whether or not a job is being done right and within the proper time. This does not mean that he must show each man how to do every job, but it sometimes happens that a particularly difficult or unusual job comes into the shop, and the workmen expect the forman to give instructions as to the best way to go about it.

In summing up, I would say that the

better foreman is one who is a tactful manager, capable of seeing that the work is done properly and within reasonable time, and who is able at all times to step in and give helpful advice about the work to his men.

—Hugh M. Mitchell

The fact that a man is a good mechanic does not necessarily mean that he would make a good foreman. Many men are better mechanics than are their foremen, or than any of their supervisors, but lack the qualities that go to make good foremen.

In selecting a man for foreman, the following points should be considered, and they are really more important than his mechanical ability: knowledge of his job; willingness to cooperate with others; willingness to take orders from his superiors and to see that they are carried out; ability to plan and systematize the work so as to get the most work from his men and from the equipment in his department; the courage to be fair minded toward his employers and his men; and the ability to enforce discipline.

—Thomas M. Garry.

In listing the qualities of a candidate for the position of foreman, the ability to handle men and the use of sound judgment should come close to the top. Although a thorough knowledge of the work is desirable, it is not as essential as are other qualities. A foreman should know how to handle men, not by the oldtime strong-arm methods, but by the application of common sense. There are no two men who can be handled exactly alike, and it is the foreman's duty to discover the best way to handle each individual.

There are many times when a job must be gotton out at a given time, and if the foreman must put several men on it, it is to his advantage to select men whose temperaments will not clash. Otherwise he can expect no results. Common sense in selecting men who can and will cooperate and work together to get the work out on time will soon establish him as a handler of men.

—Robert Knotek,
Assistant Toolroom Foreman,
Fisher Body Corporation.

If general jobbing is the problem, the experience of the foreman must be wide and general, otherwise the experience of his men must be other than that of the usual auto mechanic who knows how to do but one thing.

Modern methods call for a high degree of specialization and little or no ability of a general nature. The foreman does not plan the procedure of production and he has no choice of the speeds, feeds or kinds of tools and equipment. All these things have been definitely planned by others. At one end of the line is the planning department; at the other end is the inspection system to decide the quality and the accuracy of the work.

The average department foreman in an automobile plant is not expected to know anything as to what is usual in other departments; why the size of a hole or of that which fits in it has a definite limit. The degree of tightness or looseness is decided by others. The foreman's job is to be able to keep his men working well and in a good humor.

—James McIntosh.

In supervisory matters, each plant is something of a law unto itself. In the small shop, operating chiefly on custom work, it is desirable that the foreman be able to function as an authoritative instructor, but where the work is largely routine or mass production the picture is entirely changed.

In cases where it is necessary for the foreman to function as both manager and instructor, the result will be an increase in the cost of supervision, and this increase must be figured as additional overhead and be added to the cost of jobs handled.

—John E. Hyler.

The qualifications for a foreman depend upon his all around ability to meet what is required of him, and that, of course, depends upon the ability of the superintendent or manager to select the best man for the job.

A foreman may or may not be required to be an expert mechanic. It is more necessary that he should have expert workers under him, and that he himself should be a business man, able to get the best results in both quality and quantity for what he is paid.

—L. Brown,
Montreal, Canada.

Profit Motive

Current governmental regulation of industry is intended to give industrialists more control of industry, with power to coordinate it and eliminate unfair competition and maintain profits.

The President has explicitly stated that industry should have profits. But nothing that the government can do under our present price-fixing methods can ever be a real threat to the profit motive. That motive originates and is sustained by our monetary system. The groups that are pushing measures intended to eliminate that motive do not know the source of the motive. None of the things they propose can do it, but no doubt many industrialists fear their activities. A sense of insecurity and uncertainty seems to affect all classes and naturally tends to curtail industrial activity. Fear of monetary changes, rather than that of governmental regulation, maintains this uncertainty, which will continue until the monetary system is established on an equitable price-fixing basis.

—W. E. Brokaw,
Executive Secretary, Equitist League.

By the Week

A time clock is worth the investment as a medium for recording the number of hours worked by each employee. One element to be considered when contemplating weekly pay is the men's possible membership in one of the several unions. The unions require that no members shall work more than the prescribed number of hours, and that they be paid a certain minimum hourly rate.

Since all men do not think in the same terms, there are some who will take advantage of any system if they have the chance, and it is this unforseen force that has broken the backbone of so many idealistic plans. Unless each employee has money invested in the concern for which he works, it is doubtful if weekly pay has any possibilities.

—Harold L. Wynn,
Executive Engineer,
Pacific Electric Mfg. Corporation.

Rolling Your Own

Al has the right idea in sending his fixture work outside. While his own men may be capable of turning out accurate fixtures, they cannot possibly make them as economically as can the outside shop that is staffed and equipped for specializing in such work. Incidentally, modern practice tends toward supporting his attitude, particularly in regard to tooling up.

Time was when even the smallest shop had a section "roped off" for making jigs and fixtures, and many a good job was turned out until costs began to be scrutinized with a more critical eye. Now it is recognized as being more profitable to use the higher-skilled workers on production work and to send the tool work to the specialty shop. Even the concern having a toolroom sends some work outside and buys such standard parts as die-sets from the makers.

—Robert S. Alexander.